COGNITIVE DYSFUNCTIONS IN INTENSIVE CARDIAC CARE UNIT

Dissertation Submitted to

THE TAMIL NADU

DR.M.G.R. MEDICAL UNIVERSITY

In partial fulfilment of the regulations
for the award of the degree of

M.D. (PSYCHIATRY)
BRANCH – XVIII

GOVT. STANLEY MEDICAL COLLEGE& HOSPITAL

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI, INDIA

APRIL 2012

CERTIFICATE

This is to certify that this dissertation entitled **"COGNITIVE DYSFUNCTIONS IN INTENSIVE CARDIAC CARE UNIT"** is the bonafide original work of **Dr. K. MONICKA**, in partial fulfilment of the requirements for **MD (Branch XVIII) Psychiatry** degree examination of THE TAMIL NADU DR. MGR MEDICAL UNIVERSITY to be held in April 2012.

GUIDE
Prof. Dr. G.S.CHANDRALEKA, M.D., D.P.M.,
Professor and Head of the Department
Department of Psychiatry
Govt. Stanley Medical College & Hospital
Chennai – 600 001

Prof Dr R. SELVI, M.D.,
DEAN i/c
Govt. Stanley Medical College & Hospital
Chennai – 600 001

DECLARATION

I, Dr.K.MONICKA, solemnly declare that this dissertation entitled, **"COGNITIVE DYSFUNCTIONS IN INTENSIVE CARDIAC CARE UNIT"** is a bonafide work done by me, at Government Stanley Medical College, Chennai between 2009 – 2012, under the guidance and supervision of **Prof. Dr. G.S.CHANDRALEKA, M.D., D.P.M**., Professor and Head, Department of Psychiatry.

This dissertation is submitted to the Tamilnadu Dr.M.G.R. Medical University, towards partial fulfillment of the regulations for the award of degree of MD (Branch XVIII) Psychiatry.

Place: Chennai
Date: **(Dr.K.MONICKA)**

ACKNOWLEDGEMENT

I wish to thank **Prof. Dr. R.SELVI, M.D.,** Dean i/c, Stanley Medical College for permitting me to carry out this study.

With sincere gratitude, I wish to acknowledge the expert guidance and precise suggestions of **Prof. Dr. G.S. CHANDRALEKHA M.D.,D.P.M.**, the Professor & Head, Department of Psychiatry who helped me indesigning the study. I thank her for being a constant source of encouragement, inspiration, not only in this study but in all my professional endeavours.

I sincerely express my grateful thanks to **Prof. Dr. T.V.ASOKAN, M.D., D.P.M.,** Professor, Department of Psychiatry, for his valuable guidance and suggestions rendered throughout this study.

I am deeply indebted and highly grateful to my Professor **Dr. M. THIRUNAVUKARASU M.D., D.P.M**., for his academic guidance and professional endeavours throughout my course period.

I express my profound gratitude to **Dr.M.SURESHKUMAR, M.D., D.P.M.,** consultant Psychiatrist, Chennai for his valuable guidance and suggestions rendered throughout my study.

I also thank **Dr G.KARTHIKEYAN, M.D.,D.M**., Professor and Head, Department of Cardiology, Stanley Medical College, for giving me permission to do my thesis work in his department.

I also thank **Dr. V.VENKATESH MATHAN KUMAR M.D., and Dr.M.MOHAMED ILYAS M.D., D.P.M**., Assistant professors, Department of Psychiatry for their constructive criticisms, without which this work would not be in the present shape.

I wish to thank all my Co-postgraduates and other staff members of the Department. Without their help this thesis would not have been completed. I extend my thanks to all patients who participated in this study.

My whole hearted thanks to my parents, family members and friends for their moral support and encouragement.

Above all, I thank the God Almighty for blessing me and giving me strength to complete this dissertation.

CONTENTS

INTRODUCTION

Chronic heart failure and cognitive impairment are common problems in the elderly. Both are associated with increased mortality and disability. While these conditions may occur by chance in the same individual, there is increasing evidence that heart failure is independently associated with cognitive impairment. (Bennett & Sauve, 2003).[2]

Cognitive impairment is a common and potentially reversible condition among patients with heart failure, particularly in the elderly. It is described to be associated with an almost five-fold increase in mortality in patients with chronic heart failure(Zuccala, Pedone, Cesari, Onder, Pahor, Marzetti, *et al*.2003).[3]

Both these conditions are associated with increased morbidity, mortality, disability, decrease in quality of life and increased health care costs. Though these conditions may occur together in the same individual, there is increasing evidence that heart failure is independently associated with cognitive impairment. Results show that death occurred in 18% of those who had cognitive impairment with respect to 3% of those with normal cognition. Thus, cognitive impairment is proposed to be an independent prognostic marker in patients with heart failure. Hence simple cognitive screening test should be a part of the routine assessment (Zuccala ,Pedone , Cesari , Onder , Pahor , Marzetti, *et al*.2003).[3]

The mechanism of cognitive deficits in cardiac patients is unclear and it may be related to multiple infarcts, acute or chronic hypoxic damage secondary to arrhythmias, cardiac failure, or small vessel disease of the brain (Barclay , Weiss , Mattis , Bond , Blass 1988).[4]

Congestive cardiac failure is a frequent complication of most diseases of the heart and associated with impairment in several aspects of the quality of life of patients, including mood and cognitive performance. Patients with congestive cardiac failure display deficits in memory and other intellectual abilities, which may be the reason for poor follow-up rates and poor drug compliance(Almeida, Flicker 2001).[5].Verbal memory impairment in older patients with low ejection fraction puts them at greater risk of poor treatment outcomes through the effect of cognitive dysfunction on medication management, compliance with treatment plan, and the patient's ability to accurately remember and report important symptoms to their physicians.

Neurocognitive dysfunction in chronic heart failure represents a daunting morbidity progressing to loss of self-reliance. Although the precise mechanisms arbitrating the development of this disorder remain elusive, microembolization and cerebral hypoperfusion are implicated.

Cognitive dysfunction in patients with heart failure is independently associated with disability, which currently represents an overwhelming medical

and financial problem to patients, caregivers, and public health services (Zuccalà , Onder , Pedone , Cocchi, Carosella , Cattel , et al,2001.) [14].

Systematic neuropsychological testing of older patients with heart failure for early diagnosis of cognitive impairment might identify those who may most benefit from prompt echocardiographic evaluation and aggressive treatment of left ventricular dysfunction. Such a multidisciplinary approach to older patients with heart failure may play a key part in reducing the burden of so called "circulatory dementia" in advanced age, as the prevalence and incidence of heart failure are rapidly increasing, and substantial decreases in cognitive function have been associated in general populations with diagnosis of cardiovascular diseases. (Breteler, Claus, Grobbee, Hofman1994).[17].

REVIEW OF LITERATURE

Cognition is the scientific term for mental processes. These processes include Attention, remembering, producing and understanding language, solving problems, and making decisions. Cognition is studied in various disciplines such as psychology, philosophy, linguistics, and computer science. Usage of the term varies in different disciplines; for example in psychology and cognitive science, it usually refers to an information processing view of an individual's psychological functions. The term cognition (Latin: *cognoscere*, "to know", "to conceptualize" or "to recognize") refers to a faculty for the processing of information, applying knowledge, and changing preferences. Cognition, or cognitive processes, can be natural or artificial, conscious or unconscious.

Abnormal prevalence of cognitive dysfunction has been reported in middle aged patients with end stage heart failure. Increasing age and lower indices of left ventricular function were associated with worsening cognitive performance. However, the linkage between ageing, left ventricular systolic function, and cognitive performance remains elusive (Zuccala, Cattel, Manes-Gravina, Di-Niro , Cocchi , Bernabei 1997).[13]

Cognitive impairment may be more common in patients with heart failure than in the general population (Zuccala, Onder, Pedone, Carosella, Pahor, Bernabei *et al* 2001).[14] Other investigators have reported that 23 to 53% of patients with heart failure have evidence suggestive of cognitive impairment (Zuccala, Cattel, Manes-Gravina, Di-Niro, Cocchi, Bernabei 1997).[13] The risk of cognitive impairment in patients with heart failure was

1.96 times the risk in the general population, 65 years or older (Zuccala , Cattel, Manes-Gravina , Di-Niro , Cocchi , Bernabei, 1998).[13] Congestive Heart Failure is associated with Cognitive Impairment in subjects aged 65 years and older. Systolic Blood Pressure reduction and the lack of Heart Rate increase, related to New York Heart Association classes, might characterize cognitively impaired subjects with Congestive Heart Failure. (Cacciatore, Abete, Ferrara , Calabrese , Napoli , Maggi , et al, 1998).[15]

RISK FACTORS FOR COGNITIVE IMPAIRMENT

Cognitive impairment is an invalidating condition and its prevalence increases significantly with age. It is very important to identify the risk factors for cognitive impairment. Aside from age, sex, family history and educational level, the other major risk factors (hypertension, hypercholesterolemia, diabetes mellitus and tobacco), known to be associated frequently with different cerebrovascular diseases, might also contribute to degenerative forms of cognitive impairment because they might favour cerebral micro vascular alterations with hypo perfusion, demyelinization and ischemic lesions of sub cortical white matter.

Longitudinal epidemiological studies detected that arterial hypertension, hypercholesterolemia and tobacco are frequently associated with degenerative form of cognitive impairment. Some studies show there is no relationship between cognitive impairment and diabetes mellitus, while other underline its role; alcohol drinking, in small amounts, might protect against cognitive impairment. Other recently identified risk factors might be hyperhomocysteinemia and high C-reactive protein blood levels because they

seem to be associated with cognitive impairment. (Cicconetti, Riolo, Priami, Tafaro, Ettore, 2004).[30]

For every 10 mm Hg increase in Systolic Blood Pressure, there was a 10% reduction in cognitive impairment and there was a 13% reduction in cognitive impairment with every 10 mm Hg increase in Diastolic Blood Pressure. (Pandav, Dodge, DeKosky, Ganguli, 2004).[42] Hypertension and diabetes mellitus were positively associated with cognitive decline over 6 years in this late middle-aged population. Interventions aimed at hypertension or diabetes that begins before age 60 might lessen the burden of cognitive impairment in later life. (Knopman, Boland , Mosley, Howard, Liao, Szklo, et al, 2001).[29] Low hemoglobin is associated with AlzhiemersDisease and should be investigated further as a modifiable risk factor. (Pandav, Chandra , Dodge , DeKosky , Ganguli2004).[52]

The Metabolic Syndrome is a risk factor for diabetes, stroke, myocardial infarction, and increased mortality, and has been associated with cognition in some populations. It was hypothesized that Metabolic Syndrome would be associated with lower Mini-Mental State Examination scores in a multi-ethnic population, and that Metabolic Syndrome is a better predictor of cognition than its individual components or diabetes. Metabolic Syndrome was associated with lower cognition in a multi-ethnic population. (Vieira, Elkind, Moon, Rundek, Boden-Albala, Paik, et al, 2011).[32] Physical frailty is associated with incident mild cognitive impairment in community-based older persons. (Boyle, Buchman, Wilson, Leurgans, Bennet 2010).[34]

Alcohol abuse is another factor that may contribute to the development cardiomyopathy (and consequently lead to Congestive Heart Failure) and

cognitive impairment. Hence, in clinical settings it is not uncommon for patients with a positive history of alcohol abuse or dependence to present with dementia and Congestive Heart Failure at the same time. The results of the present study indicate that there was an excess of patients with Congestive Heart Failure who made regular use of alcohol, although none of them showed signs suggestive of the diagnosis of alcohol abuse or dependence. (Bathla, Murthy, Chandna2010) [1]

THE MECHANISM OF COGNITIVE DEFICITS IN CARDIAC PATIENTS

Abnormalities of mental functions are common problems in congestive cardiac failure patients, which are more frequent and more serious as the heart failure progresses. Cardiac output and cerebral blood flow are preserved due to compensatory mechanism in mild heart failure but can be severely compromised in advanced heart failure. Drugs used to treat heart failure, especially digitalis, can produce a wide variety of mental aberrations including delirium. (Vrobel, 1989) [7]

Micro embolization and cerebral hypo perfusion were implicated for neurocognitive dysfunction in chronic heart failure. Other causes of cognitive decline may include prior cardiac surgery, chronic hypertension; sleep disordered breathing, hyper homocysteinemia and dementia of ageing. The discovery of neurocognitive defects in heart failure must prompt a well constructed diagnostic evaluation to search for the underlying cause since this process might be at least partially reversible in many cases. (Sangha, Uber, Park , Scott , Mehra, 2002).[11]

Hemodynamic alterations due to heart failure and cognitive deteriorations are very frequently associated in aging, increasing morbidity and mortality risk. Psychosocial variables such as illiteracy, depression and particularly cognitive deterioration determine a significant increase of the risk to develop heart failure. Attention should be paid to encourage mild physical activity to provide emotional support to patients and also to assess their general cognitive abilities. Hence multidimensional approach is necessary to better characterize and treat elderly patients in particular those with congestive cardiac patient (Rengo, Acanfora, Trojano, Scognamiglio, Ciaburri, Ceriello, *et al*.1995).[12]

Low-output states such as systemic hypotension (Rengo, Acanfora, Trojano, Scognamiglio, Ciaburri, Ceriello, *et al*. 1997)[12] and low ejection fraction(Almeida, Tamai, 2001)[9] also have been implicated as causes of cognitive impairment in patients with heart failure. Systolic hypotension is selectively associated with cognitive impairment in older patients with heart failure. Low-output states can reverse cognitive dysfunction, the routine management of heart failure should include systematic assessment of cognitive performance. (Zuccalà, Onder, Pedone, Carosella, Pahor, Bernabei, et al 2001).[14]

Mechanism by which ejection fraction has a role in memory function among older patients with heart failure is not fully established. The pathophysiology underlying the development of Cognitive Impairment in Heart Failure patients may be related to both cerebral infarction and cerebral hypo perfusion either alone or in combination.(Bennett SJ, Sauve MJ2003).[2] Zucallà et al 1997[13] observed a linear relationship between Mini- Mental

Status Examination scores and left ventricular ejection fraction rates for values lower than 40%.

Arterial hypotension has been associated with increased risk of dementia in some large prospective studies and cognitive impairment is common among elderly with left ventricular function. As early treatment of cardiac low-output states can reverse cognitive dysfunction, the routine management of heart failure should include systematic assessment of cognitive performance. (Zuccala, Onder, Pedone, Carosella, Pahor, Bernabei, et al, 2001).[14]

An association between cerebral small-vessel disease and decline in information processing speed, executive function and memory was found. Increasing severity of periventricular White Matter Lesion and generalized brain atrophy and the presence of brain infarcts on MRI were associated with a steeper decline in cognitive function. These structural brain changes were MRI measures of cerebral small-vessel disease and were specifically associated with decline in information processing speed and executive function. (Prins, van Dijk, den Heijer, Vermeer, Jolles, Koudstaal, et al 2005). [26]. Lesion progression was associated with a paralleled decline in general cognitive function and in particular with a decreased information processing speed.(van Dijk, Prins, Vrooman, Hofman, Koudstaal, Breteler.2008)[27]

Lacunar lesions are independently associated with disability and cognitive impairment. Among the lesions observed on conventional MRI in cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL), the overall lacunar lesion burden seems to have the most important impact on cognitive function and disability.

(Viswanathan, Gschwendtner, Guichard, Buffon, Cumurciuc, O'Sullivan ,et al. 2007).[28].

THE COGNITIVE FUNCTIONS THAT WERE MOST OFTEN IMPAIRED IN PATIENTS WITH HEART DISEASE

During hospitalization, up to 72% of the patients had mild to severe impairment in one or more cognitive areas, delayed recall being the most common deficit during hospitalization. Six months later, 29% of the patients continued to be impaired and all had deficits in delayed recall (Sauve, Walker, Massa, Winkle, Scheinman, 1996).[8]. Patients with heart failure experience problems with memory, attention, speed and flexibility of mentation, reaction time and concentration (Almeida ,Tamai, 2001).[9].

The cognitive functions that were most often impaired in patients with chronic heart failure were short-term verbal memory, short term visual spatial memory, differed verbal memory, verbal learning and visual spatial logical ability. The high prevalence of short term verbal memory impairment has important implications in clinical practice since congestive cardiac patients should be actively involved in medical management of their disease. Memory deficits could compromise patient's adherence to the treatment. (Callegari, Mujani, Giardini, Pierobon , Opasich, Cobelli, et al 2002).[10].

Memory and attention deficits are the most frequently occurring cognitive impairment, followed by slowed motor response times and difficulties in problem solving. Prevalence rates range from 30 to 80%. Most patients have mild impairment, although as many as one fourth may have moderate to severe cognitive impairment. Cerebral infarction and cerebral hypo

perfusion either alone or in combination might be the underlying pathophysiology. (Bennett ,Sauve2003) [2]

Patients with heart failure performed significantly worse than the cardiac patients without heartfailure, on several measures of executive functioning and psychomotor speed. Among the heart failure group, lower ejection fraction was associated with weaker global cognition, performance on several, but not all, measures of executive functioning, and was marginally associated with delayed memory. Decreased cardiac index was associated with poorer immediate memory and weakly associated with global cognition (Hoth , Poppas, Moser, Paul, Cohen 2008).[53]

ASSESSMENT OF THE SEVERITY OF CARDIAC DISEASES

Table 1: New York Heart Association Classification of severity of heart disease

Functional Capacity	Objective Assessment
Class I	Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitations, dyspnea, or anginal pain.
Class II	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.
Class III	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea, or anginal pain.
Class IV	Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of heart failure or the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.

(New York Heart Association; 1964);[56]

CONDITIONS FOR WHICH PATIENTS ARE ADMITTED TO ICCU

Chest pain and Acute Coronary Syndromes and Acute Myocardial Infarction:

Acute coronary syndrome refers to a group of clinical conditions caused by myocardial ischemia including unstable angina, non-ST-segment elevation myocardial infarction, and ST-segment elevation myocardial infarction. Appropriate and accurate diagnosis has life-saving implications and requires a quick but thorough evaluation of the patient's history, physical examination, electrocardiogram, radiographic studies, and cardiac biomarkers. The management of patients with suspected or confirmed acute coronary syndrome continues to evolve as new evidence from clinical trials is considered and as new technology becomes available to both primary care physicians and cardiologists. Low- and intermediate-risk patients have frequently been managed in a chest pain centre or in the emergency department. While stress testing with or without radionuclide imaging is the most common evaluation method, a CT angiogram is sometimes substituted. High-risk patients are often managed with an early invasive strategy involving left heart catheterization with a goal of prompt revascularization of at-risk, viable myocardium. With the increased availability of cardiac catheterization facilities, patients with ST-segment elevation myocardial infarction are more commonly being managed with primary percutaneous coronary intervention, although thrombolysis is still used where such facilities are not immediately available.(Weiner, Rabbani, 2011).[55]

Heart failure: Some patients admitted to the hospital require advanced cardiac care in the ICCU. Management usually involves invasive hemodynamic monitoring and inotropic or vassopressor support that cannot be done outside the ICCU in most institutions.(Weiner, Rabbani, 2011). [55]

Pulmonary hypertension: Patients with New York Heart Association functional classIV may require ICCU for management.(Weiner, Rabbani, 2011). [55]

Arrhythmias: Patients with arrhythmias needing management in ICCU include patients with tachyarrhythmia and bradyarrhytyhmias and survivors of sudden cardiac death.(Weiner, Rabbani, 2011). [55]

Cardiogenic shock: It is the most severe form of left ventricular failure. It can occur as a complication of acute Myocardial Infarction or from other cardiovascular conditions. (Weiner, Rabbani, 2011).[55]

Other conditions that require admission to ICCU are Adult congenital Heart diseases, Valvular heart disease, Aortic disease, Hypertensive Emergency, Cardiac Tamponade and Pulmonary Embolism.ICCU is a post-reperfusion unit for treating complications of therapy and older and more complex patients who require more intensive care.(Weiner, Rabbani, 2011).[55]

COGNITIVE DEFICITS ARE MORE IN ICCU PATIENTS

The cognitive dysfunctions of the intensive cardiac care unit (ICCU) showed an overall cognitive decline on both Standardised Mini-Mental Status Examination and Brief Cognitive Rating Scale scores and the presence of global cognitive deficit. Standardised Mini-Mental Status Examination score showed deficits in the domain of orientation, attention and constructional ability. The Standardised Mini-Mental Status Examination scale did not show any statistical significance in the domains of registration, recall and language. (Bathla, Murthy, Chandna, 2010)[1]. Brief Cognitive Rating Scale score showed deficits in the domain of concentration. Other domains assessed using Brief Cognitive Rating Scale such as recent memory, past memory, orientation and functioning and self-care were statistically not significant. (Bathla, Murthy, Chandna 2010).[1]. A study by Grubb et al, 2000,[23] showed no memory impairment in ICCU patients. A study by Dijkstra et al, 2002[22] showed that depressed myocardial infarction patients performed better with respect to memory.

PSYCHOLOGICAL IMPLICATIONS OF ADMISSION TO CRITICAL CARE.

Treatment in an intensive care unit can be stressful and may leave patients with persisting psychological symptoms that impair quality of life. A proportion of the post-traumatic stress reported was directly attributable to the experience of treatment in the intensive care unit. (Scragg, Jones, Fauvel. 2001).[50] Admission to critical care can have far-reaching psychological effects because of the distinct environment. Critical care services are being re-shaped

to address long-term sequelae, including post-traumatic stress disorder, anxiety and depression. The debate around the phenomenon of intensive care unit (ICU) syndrome is discussed with reference to current thinking. After critical care, patients may experience amnesia, continued hallucinations or flashbacks, anxiety, depression, and dreams and nightmares. Nursing care for patients while in the critical care environment can have a positive effect on psychological well-being. (Pattison , et al, 2005).[44]

High rates of psychiatric disorders in adult CCU patients but low rates of detection and only moderate rates of treatment by CCU staff. (Rincon, Granados, Unutzer, Gomez, Duran, Badiel, et al, 2001).[45] Critically ill patients in the ICU predominantly experienced sleeping disorders, mostly related to the presence of noise . Psychological problems after ICU stay were reported by the patients, i.e. fear, inability to concentrate, complaints of depression and hallucinations. (Hofhuis, Spronk, van Stel, Schrijvers, Rommes, Bakker;2008).[46]

Extremely stressful experiences of the ICU are associated with subsequent psychological distress. Female sex, agitation and extreme fear during the ICU stay seem to increase the risk of developing high levels of acute Post Traumatic Stress Disorder -related symptoms.(Samuelson, Lundberg, Fridlund ; 2007).[47]

The prevalence of posttraumatic stress disorder symptoms and Post Traumatic Stress Disorder in patients following ICU hospitalization is high -

about 20 percent," "For people who have a prior history of depression and anxiety disorders such as Post Traumatic Stress Disorder and other mental health disorders, stressful situations can bring about exacerbations of their underlying psychiatric illness. To be treated in an ICU, a person is critically ill and often near death, so it's a very severe stressor. That combination may lead to a later exacerbation of their prior psychiatric disorder. In addition, patients sedated with benzodiazepine medications (such aValium and Xanax) proved more likely to develop Post Traumatic Stress Disorder symptoms after their ICU stay, as did patients who remembered frightening in-ICU experiences after ICU treatment. (Davydow, Gifford , Desai, et al, 2008).[48] The mean level of posttraumatic stress symptoms in patients one year following ICU treatment was high. Pessimism was a predictor of posttraumatic stress, anxiety and depression symptoms. A subgroup of patients developed clinically significant distressing symptoms during the follow-up period. (Myhren, Ekeberg, Tøien, Karlsson, Stokland; 2010).[51]

In patients with heart failure, cognitive impairment may be intermittent or subtle in the early stages and thus not easily recognized. If so, routine screening is essential to ensure that cognitive impairment is detected and addressed as quickly as possible. In order to do so, practical, time-efficient, and sensitive measures are needed. Cognitive screening tools should be tested against a reference standard, such as a clinical neuropsychological battery, so that the sensitivity and specificity of simple measures for detecting cognitive impairment in patients with heart failure could be identified. (Riegel, Bennett, Davis, Carlson, Montague, Robin, et al, 2002).[16]

AIMS AND OBJECTIVES

To determine cognitive dysfunctions in patients with heart disease admitted in intensive cardiac care unit, who are acutely ill and to compare it with patients admitted in general medical wards with heart diseases.

MATERIALS AND METHODS

STUDY DESIGN

Cross- sectional study (Non- Interventional).

STUDY VENUE

Government Stanley Hospital.

STUDY POPULATION

Patients diagnosed as having cardiac disease, admitted in Intensive Cardiac Care Unit and patients admitted in general medical ward with heart disease.

METHOD

A total of 30 patients admitted to ICCU with heart disease were taken for the study and compared to patients with heart disease admitted in general medical wards. The tools used were a semi-structured proforma, HADS (Hospital anxiety-depression scale), SMMSE (Standardized Mini Mental Status Examination) and BCRS (Brief Cognitive Rating Scale). Statistical tests used were Student‘t’ test and Chi-Square test.

TOOLS AND INSTRUMENTS:

1) Semi-Structured Proforma
2) Hospital anxiety and depression scale (HADS)
3) Standardized Mini-Mental State Examination (SMMSE).
4) Brief Cognitive Rating Scale (BCRS).

INCLUSION CRITERIA:

1) Patient admitted in ICCU with heart disease.

2) Patient admitted in general medical ward with heart disease.

3) Age: 18-64 years.

4) Patients who stayed for at least three days.

EXCLUSION CRITERIA:

1) Patients <18yrs and >64yrs.

2) Any psychiatric consultation in last one month prior to the study.

3) Patient with known history of any chronic organic mental illness.

4) Patients with multiple chronic diseases causing cognitive impairment like neurodegenerative disease, thyroid and adrenal disorders, renal disorders, cancers and stroke.

5) Patients who are critically ill and who cannot participate in the study like patients on respiratory or ventilator support.

Semi- structured Proforma

A semi structured Proforma was designed exclusively for this study that obtained information relating to socio-demographic data, medical and psychiatric history, other relevant clinical variables.

HADS Hospital anxiety and depression scale:

In order to assess the anxiety and depression particularly in medical settings, in particular hospital settings, the hospital anxiety and depression scale has been designed as a simple and reliable tool. It was designed by R Philip Snaith.In this scale, 'depression' is assessed according to the questions: " Do you take as much interest in things as you used to? Do you laugh as readily? Do you feel cheerful? Do you feel optimistic about the future?" i.e. there was not concentration on the anhedonic state alone. The 'anxiety' level is assessed by the questions: "Do you feel tense and wound up? Do you worry a lot? Do you have panic attacks? Do you feel something awful is about to happen?". The questionnaire responses are analysed in the light of the results of this estimation of the severity of both anxiety and of depression. The number of items in the questionnaire is just seven reflecting anxiety and seven reflecting depression. (Of the seven depression items five reflected aspects of reduction in pleasure response). Each item has to be answered by the patient on a four point (0–3) response category so the possible scores ranged from 0 to 21 for anxiety and 0 to 21 for depression. An analysis of scores on the two subscales of a further sample, in the same clinical setting, enables provision of information that a score of 0 to 7 for either subscale could be regarded as being in the normal range, a score of 11 or higher indicating probable presence ('caseness') of the mood disorder and a score of 8 to 10 being just suggestive of the presence of the respective state.

SMMSE : The Standardized Mini-Mental State Examination

The Standardized Mini-Mental State Examination (SMMSE) was developed and tested to provide clear explicit administration and scoring instructions to reduce variability and increase the reliability of the Mini-Mental Status Examination.(Molloy, Standish, 1997).[43]

The Mini-Mental State Examination is a valid and reliable instrument widely used to screen for cognitive impairment in older adults. The reliability of the original instrument was improved by adding explicit guidelines for administration and scoring. The Standardized Mini-Mental State Examination is used for comprehensive assessments of older adults. It provides a global score of cognitive ability that correlates with function in activities of daily living.

The Standardized Mini-Mental State Examination measures various domains of cognitive function including orientation to time and place; registration; concentration; short-term recall; naming familiar items; repeating a common expression; and the ability to read and follow written instructions, write a sentence, construct a diagram, and follow a three-step verbal command. The Standardized Mini-Mental State Examination takes approximately 10 minutes to administer, provides a baseline score of cognitive function, and pinpoints specific deficits that can aid in forming a diagnosis.

Cognitive impairment that relate to Standardized Mini-Mental State Examination scores: A total score of 30 indicates no impairment. Scores between 26 and 30 are considered normal in the general population. Patients who score between 25 and 20 have mild cognitive impairment and will be experiencing problems with the instrumental activities of daily living, such as shopping, finances, medication use, and meal preparation, but can usually live on their own with support. Those who score between 20 and 10 have moderate cognitive impairment, usually cannot live independently, and are starting to have problems with basic activities, such as grooming, dressing, and using the toilet. Scores between 9 and 0 denote severe cognitive impairment; patients will be having problems with all basic activities, including eating and walking.

The Standardized Mini-Mental State Examination is a reliable instrument that allows practitioners to accurately measure cognitive deficits and deterioration over time. It can be used in a variety of clinical settings. It can help explain why difficulties exist in certain areas of daily functioning. It provides a useful screen of cognitive abilities that can lead to effective treatments to maximize cognition and function. If in doubt about the importance of a mild memory problem, patients can be retested yearly or every 6 months. Serial Standardized Mini-Mental State Examination scores provide an accurate measurement of change in mental function over time and help to measure response to treatment,

BCRS: BRIEF COGNITIVE RATING SCALE

It was developed by Barry Reisberg, M.D. This scale has five items and they are as follows:

Axis I - Concentration

Axis II - Recent Memory

Axis III - Past memory

Axis IV - Orientation

Axis V - Functioning and self-care.

Each axis of the Brief Cognitive Rating Scale is scored independently. Each axis is designed to be optimally concordant with the other axes and with the numerically corresponding Global Deterioration Scale stage. Consequently, each axis of the Brief Cognitive Rating Scale conveys important staging related information.

For clinical purposes scores can be reported conveniently as consecutive axis scores, e.g., A6,5,6,4,5". This reporting methodology indicates relative capacity in each axis modality, i.e., concentration, recent memory, etc.

For therapeutic trials the axes can be added and total scores for the five axes can be utilized.

For staging, the Global Deterioration Scale stage is very closely equivalent to the average score of the Brief Cognitive Rating Scale axes.

Ideally, for staging purposes, the Brief Cognitive Rating Scale can be used as a semi structured procedure for guiding final Global Deterioration Scale stage assignments

PROCEDURE:

The study and its design was approved by the Stanley Medical college Ethics Committee. Following Informed consent, ICCU patients and general medical ward patients with heart disease, were administered a semi-structured proforma specifically designed for the purpose of the study which contained socio-demographic data, substance use demography, nature of medication and clinical history and factors related to cardiac problem. The medical records of the patients were duly examined after obtaining permission from the concerned departments.

Further the patients in the study group (cases) and the control group were also examined with standardised tools such as Standardised Mini Mental Status Examination and Brief Cognitive Rating Scale.

ANALYSIS:

The data obtained from them were entered into excel sheet and the data was then transformed into Epi 6 Info for statistical analysis. Comparison between these two groups were made using Chi-square test and student t-test.

RESULTS

a. Socio demographic characteristics

Table 2

Comparison of age between patients with heart disease admitted in ICCU and general medical wards

Group	Mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	55.1	12.3494	1.4070	0.1648
Patients with Heart disease admitted in general medical wards	50.1	14.8759		

Comparing the age between Patients with heart disease admitted in ICCU and general medical wards, it was found that there was no statistically significant difference across these two groups.

Table 3

Comparison of sex between patients with heart disease admitted in ICCU and general medical wards

Group	Male	Female	Chi-square value	P value
Patients with Heart disease admitted in ICCU	21	9	0.0757	0.7813
Patients with Heart disease admitted in general medical wards	20	10		

Comparing the sex between patients with heart disease admitted in ICCU and general medical wards, the above table illustrates that these two groups have similar distribution of males and females with no statistically significant difference.

Table 4

Comparison of marital status between patients with heart disease admitted in ICCU and general medical wards

Group	Single	Married	Divorced	Chi-square value	P value
Patients with Heart disease admitted in ICCU	2	28	0	6.000	0.0498
Patients with Heart disease admitted in general medical wards	6	21	3		

The two groups differed in marital status. The proportion of married people. Among patients with heart disease admitted in ICCU, was great compared with those admitted in general medical ward and this difference is statistically significant.($p<0.05$).

Table 5

Comparison of religion between patients with heart disease admitted in ICCU and general medical wards

Group	Hindu	Christan	Muslim	Chi-square value	P value
Patients with Heart disease admitted in ICCU	19	3	8	2.9922	0.2240
Patients with Heart disease admitted in general medical wards	22	5	3		

Patients with heart disease admitted in ICCU as well as in general medical wards, were comparable for their affiliation to religious groups and there was no statistically significant difference.

Table 6

Comparison of domicile between patients with heart disease admitted in ICCU and general medical wards

Group	Rural	Urban	Chi-square value	P value
Patients with Heart disease admitted in ICCU	11	19	8.0123	0.00431
Patients with Heart disease admitted in general medical wards	22	8		

Patients with heart disease admitted in ICCU, often have an urban domiciliary status, whereas those in general medical ward, hailed predominantly from rural areas. This difference was statistically significant.($p<0.005$)

Table 7

Comparison of education between patients with heart disease admitted in ICCU and general medical wards

Group	Primary	Secondary	UG	PG	others	Chi-square value	P value
Patients with Heart disease admitted in ICCU	20	9	1	0	0	12.1663	0.0162
Patients with Heart disease admitted in general medical wards	17	4	0	1	8		

Patients with heart disease admitted in ICCU, have higher secondary level of education and this difference was statistically significant.($p<0.02$).

Table 8

Comparison of occupation between patients with heart disease admitted in ICCU and general medical wards

Group	Unemployed	Unskilled	Semiskilled	Skilled	Professional	Chi-square value	P value
Patients with Heart disease admitted in ICCU	12	6	11	1	0	4.1189	0.3981
Patients with Heart disease admitted in general medical wards	16	7	6	0	1		

The occupational status of the two groups are comparable with no statistically significant difference.

Table 9

Comparison of income between patients with heart disease admitted in ICCU and general medical wards

group	<1000	1000-10,000	10,000-30,000	Chi-square value	P value
Patients with Heart disease admitted in ICCU	9	21	0	8.0850	0.0176
Patients with Heart disease admitted in general medical wards	16	11	3		

The Patients with heart disease admitted in ICCU, often had an income, in the range of 1000 to 10,000 and this difference is statistically significant.($p<0.02$).

B. Substance use related variables

Table 10

Comparison of alcohol use between patients with heart disease admitted in ICCU and general medical wards

group	Alcohol use		Chi-square value	P value
	Yes	no		
Patients with Heart disease admitted in ICCU	9	21	0.0000	1.000
Patients with Heart disease admitted in general medical wards	9	21		

Both the groups are comparable for ever use of alcohol. 30% of patients in both groups have admitted to alcohol consumption.

Table 11

Comparison of smoking among patients with heart disease admitted in ICCU and general medical wards

group	Smoking		Chi-square value	P value
	yes	no		
Patients with Heart disease admitted in ICCU	15	15	2.4583	0.113847
Patients with Heart disease admitted in general medical wards	9	21		

Comparing the two groups for smoking, it was revealed that 50% of patients in ICCU admitted to smoking whereas only 30% patients admitted in general medical ward admitted to smoking. Yet the groups did not differ in a statistically significant way for smoking.

Table 12

Comparison of years of alcohol intake between patients with heart disease admitted in ICCU and general medical wards

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	25	13.1855	0.0196	0.9845
Patients with Heart disease admitted in general medical wards	25.1	11.3187		

Table 13

Comparison of years of smoking between patients with heart disease admitted in ICCU and general medical wards

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	9.933	7.547	0.7565	0.4524
Patients with Heart disease admitted in general medical wards	8.633	5.623		

Patients in ICCU and general medical ward did not show statistically significant difference in years of alcohol intake as well as years of smoking

C. Medical problems, symptoms, co-morbid conditions

Table 14

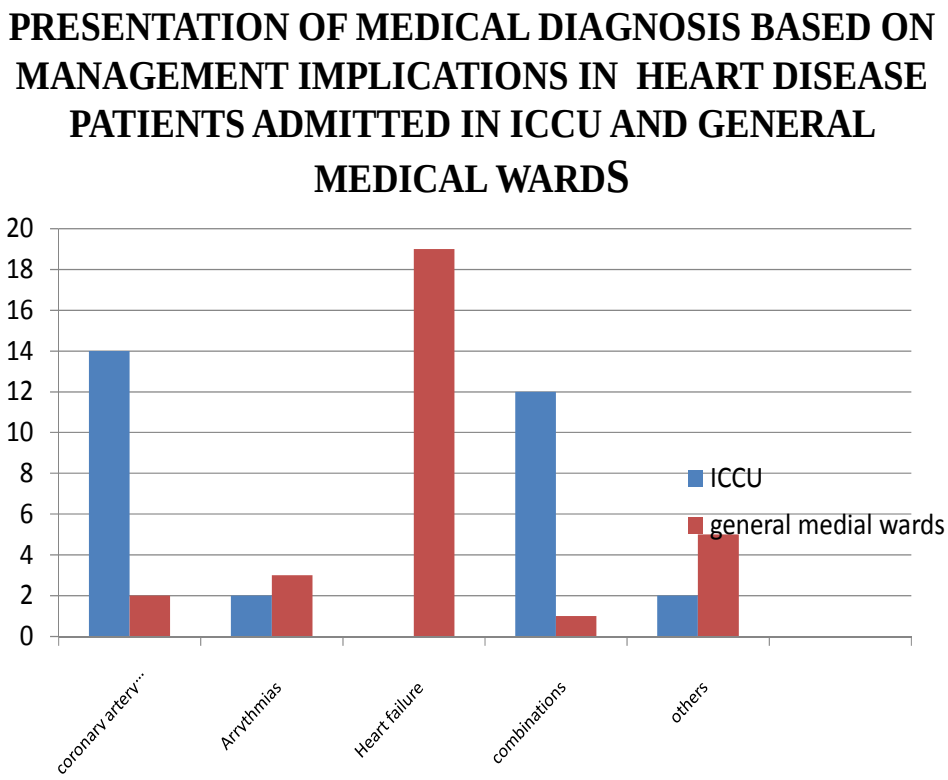
Medical diagnosis at the time of admission

Medical diagnosis	Patients with heart disease admitted in ICCU	Patients with heart disease admitted in general medical ward
Acute AWMI	1	0
Acute coronary syndrome	1	0
Acute coronary syndrome, AWMI	1	0
acute coronary syndrome, CAD	3	0
acute coronary syndrome, CAD, arrhythmia	2	0
acute coronary syndrome, NSTEMI	1	0
Acute IWMI	1	0
Anterior wall M I	2	0
Anterior wall M I, arrythmia	2	0
Anterior wall MI, arrythmia	4	0
Arrhythmia	2	2
Arrhythmia in failure	0	1
Arrythmias	0	1
Atrial septal defect in failure	0	1
CAD in failure	0	1

CAD in failure, arrythmia	1	0
Cardiac failure	0	1
Congestive cardiac failure	0	10
Coronary artery disease	0	2
Dilated cardiomyopathy in failure	0	3
Evolved Anterior wall MI and arrythmia	1	0
Inferior wall M I	1	0
Inferior wall MI	1	0
Inferior wall MI & posterior wall MI	1	0
Inferior wall MI/Ventricular arrhythmia	2	0
Rhematic heart disease in failure	0	1
Rheumatic heart disease in failure	0	1
Rheumatic heart disease, AF	1	1
Rheumatic heart disease, AF,MS,MR	1	0
Rheumatic heart disease, AF, IE	0	1
Rheumatic heart disease. CCF	0	3
STEMI, IWMI, PWMI	1	0
Valvular heart disease, ccf	0	1
TOTAL	30	30

The above table shows the distribution of the medical diagnosis at the time of admission for the heart patients admitted in ICCU and general medical wards.

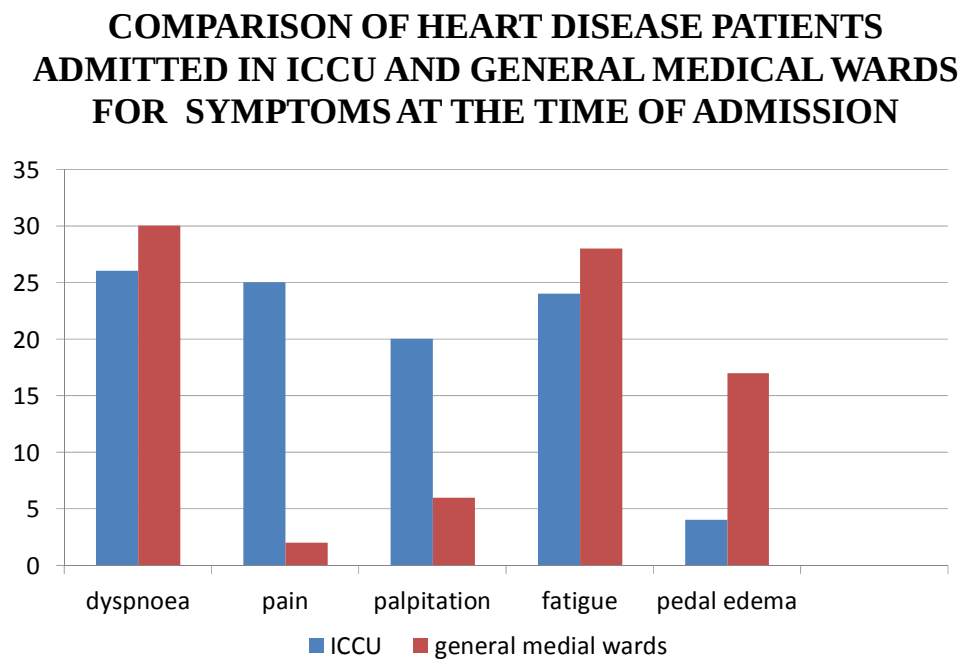
Figure 1:



It is seen from the above illustration that two-third of those admitted in general medical wards have congestive cardiac failure as the prime diagnosis. The predominant medical diagnosis for heart disease patients admitted in ICCU, is Coronary Artery Disease, specifically Myocardial Infarction. (46.67%) and Arrythmias(40%).

Symptoms at the time of admission

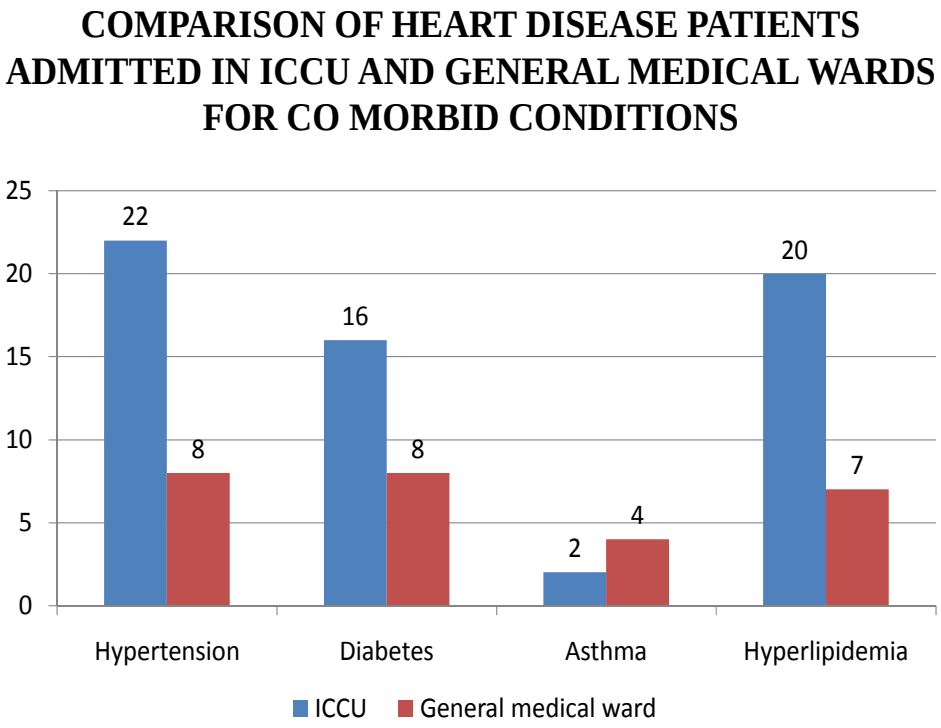
Figure 2:



83.3% of patients admitted to ICCU , present with dyspnoea on exertion as the predominant symptom at the time of admission followed by chest pain, which is present in 80% 0f them. Whereas in the general medical ward, almost half the patients present with a combination of dyspnoea on exertion, fatigue and pedal edema.

Comorbid conditions:

Figure 3:

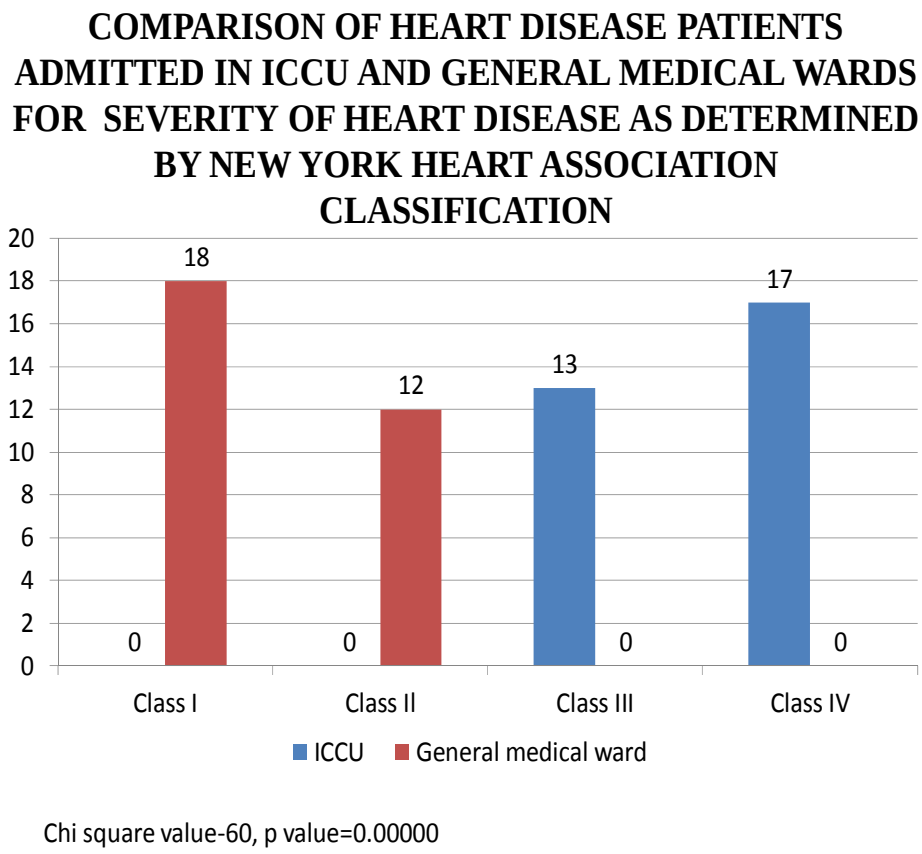


Compared with the general medical ward patients admitted for heart disease, the ICCU patients were more likely to have co-morbid conditions such as hypertension, hyper-lipidemia and diabetes mellitus.

D. Heart disease related variables

Comparison of Severity of Heart Disease as determined by New York Heart Association classification between patients with heart disease admitted in ICCU and general medical wards

Figure 4:



It is important to note that all the thirty patients in ICCU have New York Heart Association class IV (56.6%) and class III (43.3%) severity of heart disease in comparison with patients in general medical wards, who are in class I and class II of New York Heart Association classification of severity of heart disease.

Table 15

Comparison of years of cardiac problem between patients with heart disease admitted in ICCU and general medical wards

Group	Mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	16.6	11.726	0.0227	0.9822
Patients with Heart disease admitted in general medical wards	16.5	8.833		

Comparison of these two groups demonstrates that the two groups are comparable for years of cardiac problem and both groups have similar mean duration of cardiac problem (around 16 years).

Table 16

Comparison of treatment received among patients with heart disease admitted in ICCU and general medical wards

Group	Mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	4.72	5.6182	0.1827	0.8557
Patients with Heart disease admitted in general medical wards	4.48	4.3640		

Comparing the two groups for the duration of treatment received, the two groups again were comparable , in that the patients in two groups have received treatment for their cardiac problem for a mean duration of 4+ years.

Table 17

Comparison of anxiety score of Hospital Anxiety and Depression scale in patients with heart disease admitted in ICCU and general medical wards

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	15.8667	2.8616	4.9557	0.000
Patients with Heart disease admitted in general medical wards	12.2000	2.8696		

Comparison of the two groups illustrates that patients with heart disease admitted in ICCU had high total score on seven anxiety symptoms in Hospital Anxiety and Depression Scale indicating that they have greater levels of anxiety.

Table 18

Comparison of depression score of Hospital Anxiety and Depression scale in patients with heart disease admitted in ICCU and general medical wards

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	12.7000	2.6281	1.1256	0.2650
Patients with Heart disease admitted in general medical wards	11.9667	2.4138		

Comparison of the two groups illustrates that patients with heart disease admitted in ICCU as well as patients in general medical ward had comparable total score on the seven depressive symptoms in Hospital Anxiety and Depression Scale .

Comparison of Brief Cognitive Rating Scale (BCRS) between patients with heart disease admitted in ICCU and general medical wards

Table 19

BCRS-I CONCENTRATION

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	4.000	1.4622	5.5725	0.000
Patients with Heart disease admitted in general medical wards	2.1667	1.0532		

Table 20

BCRS-II- RECENT MEMORY

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	3.5333	1.4320	6.3492	0.000
Patients with Heart disease admitted in general medical wards	1.6000	0.08550		

Table 21

BCRS-III- REMOTE MEMORY

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	2.6667	1.6678	3.3397	0.0015
Patients with Heart disease admitted in general medical wards	1.5000	0.9377		

Table 22

BCRS-IV- ORIENTATION

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	3.000	1.4384	6.0308	0.0000
Patients with Heart disease admitted in general medical wards	1.2667	0.6397		

Table 23

BCRS-V-FUNCTIONING AND SELF- CARE

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	4.3000	1.6006	6.1651	0.0000
Patients with Heart disease admitted in general medical wards	2.0667	1.1725		

The heart disease patients admitted in ICCU and general medical wards were studied and compared for their cognitive function using Brief Cognitive Rating Scale.

Examination of above tables depict that these two groups differ statistically significantly in all five items of the Brief Cognitive Rating Scale.

Comparison of Standardized Mini-Mental State Examination (SMMSE) between patients with heart disease admitted in ICCU and general medical wards

Table 24

SMMSE 1a- Orientation to year

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.466	0.507	5.0784	0.000
Patients with Heart disease admitted in general medical wards	0.966	0.182		

Table 25

SMMSE : 1b-Orientation to season

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.1667	0.3790	7.4731	0.000
Patients with Heart disease admitted in general medical wards	0.8667	0.3457		

Table 26

SMMSE 1c- Orientation to month

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	0.66	0.4795	3.8079	0.0003
Patients with Heart disease admitted in general medical wards	1.00	0.000		

Table 27

SMMSE 1d- Orientation to date

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.533	0.5074	3.3919	0.0013
Patients with Heart disease admitted in general medical wards	0.90	0.3051		

Table 28

SMMSE 1e- Orientation to day of week

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.4	0.4983	5.2244	0.000
Patients with Heart disease admitted in general medical wards	0.93	0.2537		

Table 29

SMMSE 2a- Orientation to Country

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.8667	0.3457	0.3959	0.6936
Patients with Heart disease admitted in general medical wards	0.9	0.3051		

Table 30

SMMSE 2b- Orientation to State

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	0.83	0.379	1.7358	0.0879
Patients with Heart disease admitted in general medical wards	0.9667	0.182		

Table 31

SMMSE 2c- Orientation to city

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	0.83	0.379	2.4083	0.0192
Patients with Heart disease admitted in general medical wards	1.0	0.00		

Table 32

SMMSE 2d- Orientation to Hospital

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.8667	0.3457	0.8515	0.3980
Patients with Heart disease admitted in general medical wards	0.93	0.2537		

Table 33

SMMSE 2e - Orientation to floor of building

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	0.23	0.4302	5.2420	0.000
Patients with Heart disease admitted in general medical wards	0.80	0.4068		

Table 34

SMMSE 3- Registration

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	2.2	1.1861	2.1047	0.0397
Patients with Heart disease admitted in general medical wards	2.7	0.5350		

Table 35

SMMSE 4- Spelling WORLD backwards

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	2.1333	1.2794	5.4962	0.0000
Patients with Heart disease admitted in general medical wards	3.7667	1.0063		

Table 36

SMMSE 5- Recall

group	mean	SD	t value	P value
Patients with Heart disease admitted in ICCU	1.533	1.0417	2.2710	0.0269
Patients with Heart disease admitted in general medical wards	2.10	0.8847		

Table 37

SMMSE 6- Identifying Wristwatch

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.8667	0.3457	2.1122	0.0390
Patients with Heart disease admitted in general medical wards	1.000	0.000		

Table 38

SMMSE 8- repeat " No Ifs, and or buts"

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.2000	0.4068	3.7261	0.0004
Patients with Heart disease admitted in general medical wards	0.6333	0.4901		

Table 39

SMMSE 9- Reading

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.8000	0.4068	2.6926	0.0093
Patients with Heart disease admitted in general medical wards	1.000	0.000		

Table 40

SMMSE 10- Checking for Apraxia

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	2.53	1.07	1.4056	0.1652
Patients with Heart disease admitted in general medical wards	2.83	0.46		

Table 41

SMMSE 11- Writing

group	Mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.5	0.5085	0.5100	0.6120
Patients with Heart disease admitted in general medical wards	0.56	0.504		

Table 42

SMMSE 12- Copying design

group	mean	SD	T value	P value
Patients with Heart disease admitted in ICCU	0.266	0.4498	0.8234	0.4137
Patients with Heart disease admitted in general medical wards	0.366	0.4901		

In order to comprehensively assess the relationship between heart disease severity & heart disease status and cognitive functioning, another measure namely Standardised Mini-Mental Status Examination, was utilised in this study. This measure has 12 items.

In examination of the above tables , it is revealed that there is significant difference between two groups with respect to Orientation to time (Orientation to year, Orientation to season, Orientation to month, Orientation to date , Orientation to day of week).

Also it is seen that there is statistically significant difference between heart disease patients admitted in ICCU and general medical wards, in Orientation to city and Orientation to floor of building.

Moreover for the following items, statistically significant difference was seen between the two groups- Registration, Spelling WORLD backwards. Recall, Identifying Wristwatch, repeat " No Ifs, and or buts", Reading.

DISCUSSION

The socio-demographic characteristics of two groups namely patients with heart disease admitted in ICCU and general medical wards did not differ statistically significantly for age, religion, education and occupation. Marital status, urban domiciliary status and higher income are significantly associated with patients with heart disease in ICCU.

It can be argued that there could be a relationship for urban living, higher income and lifestyle that may contribute to metabolic derangement and severity of heart disease necessitating ICCU admission. These findings are in concordance with the Northern Manhattan study- the metabolic syndrome and cognitive performance- the metabolic syndrome is a risk factor for diabetes, stroke, myocardial infarction, and increased mortality, and has been associated with lower cognition in some populations. (Vieira , Clkind , Moon , Rundek , Boden-albala , Paik , Sacco ,Wright ,2011).[32].

The two groups are comparable for substance use in that both groups have 30% of patients admitting to alcohol consumption. Even though half of the patients in ICCU had a history of smoking compared to 30% in medical ward group the difference was not statistically significant. Similarly the two groups are comparable for duration of alcohol and tobacco intake. As the two groups did not statistically differ in substance use, this may not be the factor

that could contribute to differential medical or co morbid conditions, psychiatric symptoms and cognitive functioning in these two groups.

Admission to ICCU or general medical ward is primarily determined by acute and severe nature of presenting symptoms. The study findings reveal that most of the patients in ICCU had a combination of dyspnoea on exertion and chest pain. The prime medical diagnosis in ICCU patients was Coronary heart disease .In addition the ICCU patients had co morbid conditions like hypertension, hyperlipidemia and diabetes. These findings are in concordance with the Northern Manhattan study- the metabolic syndrome and cognitive performance- the metabolic syndrome is a risk factor for diabetes, stroke, myocardial infarction, increased mortality and has been associated with lower cognition in some populations. (Vieira, Elkind, Moon, Rundek, Boden-albala, Paik, Sacco, Wright, 2011).[32] These findings reveal that those with severe heart diseases as determined by New York Heart Association are the ones most likely to get admitted in ICCU.

The patients with heart disease in ICCU exhibited greater levels of anxiety symptoms as compared with general ward patients. Most of them were very definite that they got a sort of frightened feeling. Given the acute and severe nature of the disorder, many of them spent a great deal of the time with worrying thoughts going through their mind, in addition, they also reported that they cannot sit at ease and feel relaxed. Another symptom which was reported by most of them was sudden feelings of panic very often. Review of the

literature clearly indicated that the stress in patients of ICCU can be equated with the patients of Post-traumatic stress with reference to their agony .(Scragg, Jones, Fauvel.2001.[50] (Samuelson, Lundberg, Fridlund; 2007).[47] On the other hand both the groups were comparable for depressive symptoms. In both groups though patients exhibited complaints related to depression, there was no statistical difference between the two groups.

The two groups were compared for cognitive functioning using Brief Cognitive Rating Scale. The findings indicate that the impairment in concentration, recent memory, past memory, orientation and functioning and self care is markedly impaired in heart disease patients admitted in ICCU, compared to those admitted in general medical ward. It may be hypothesised that the significant impairment and cognitive dysfunction is associated with the severity of heart disease. Other factors that would have contributed to the statistically significant difference to the cognitive dysfunction is the higher prevalence of co-morbid conditions such as hypertension, hyperlipidemia and diabetes. Brief Cognitive Rating Scale showed a statistically very highly significant deficit in the domain of concentration in an Indian study that was recently done in Haryana in India (Batla, Murthy,Chandna,2010). [1] and also in a previous study by Sauve et al, 1996. [8].

Further, the two groups were evaluated for cognitive functioning using Standardised Mini-Mental Status Examination. The results indicated that the two groups differed statistically significantly for orientation to year, season,

month, date and day of the week. Additionally the two groups differed statistically significantly for orientation to city and orientation to floor of the building. A recent study that was done in Haryana in India (Batla, Murthy, Chandna,2010).[1] also showed that orientation was impaired in patients admitted to ICCU. Moreover patients admitted in ICCU had statistically significant disturbance to registration, recall, reading, spelling backwards, identifying wrist watch, and repeating 'no, ifs, and or buts.' Similar findings of disturbance to different domains of cognitive functions have been revealed in the study by Batla, Murthy, Chandna,2010[1] at Haryana, India.

In this study, no statistical difference was obtained for writing, apraxia and copying design, whereas in the Haryana study[1] patients in ICCU had impairment to constructional ability. Over all the study demonstrated that cognitive functioning is disturbed in patients admitted to intensive care unit.

It is possible that in view of high levels of anxiety that are found among patients with heart disease in ICCU, some of the disturbance to cognitive domains such as attention and concentration may be linked, but in this group, disturbance in cognitive functions extends beyond attention, concentration and includes domains of orientation. Furthermore marked impairment in all five axes of Brief Cognitive Rating Scale- namely concentration, recent memory, remote memory, orientation, functioning and self care, is found in ICCU patients and hence the cognitive dysfunctions is more related to severity of the disease and comorbid conditions.

From the above findings, it can be said that it is necessary to recognise high levels of anxiety among heart disease patients particularly those in ICCU settings. Persistence of psychological symptoms such as anxiety could impact on quality of life of patients. Thus it is imperative that following a comprehensive assessment of anxiety symptoms, alleviation of anxiety symptoms should be integral to treatment interventions in these patients. Patients can be definitely helped by measures that potentially reduce anxiety symptoms such as psycho –education and the potential therapeutic interventions, reassurance, supportive measures, family education and in anxiety prone situations. A study done by Peris, Bonizzoli, Iozzelli, 2011 [54] reveals that psychological disorders are frequent among ICU survivors. Early intra-ICU psychological intervention with the presence of an intra-ICU clinical psychologist may help critically ill trauma patients recover from this acute, stressful experience and can decrease the risk of post-traumatic stress disorder, anxiety and depression at 12 months after ICU discharge.

CLINICAL IMPLICATIONS

The prime objective of the study is to evaluate cognitive functioning and its associated factors in heart disease patients. Factors such as age, severity of illness were included for the study as they are important contributors to the aetiology of cognitive dysfunction. In contrast to the earlier Indian study, that did not consider age and severity of illness, that impact on cognitive impairment, this study included these two critical variables. Similarly efforts were taken to scrutinize the medical records in detail, to ascertain medical diagnosis, symptoms and co-morbid medical conditions. Another important addition is to evaluate psychological symptoms such as anxiety and depression as this can have a bearing on the cognitive functioning. In this study, in view of the fact that the patients were evaluated within three to four days of admission into either intensive care unit or general medical ward, it was difficult to identify diagnosable psychiatric disorders such as anxiety and depression but they were assessed for anxiety and depressive symptoms and levels of it using Hospital Anxiety and Depression Scale.

This study demonstrated that there was significant impairment to all five cognitive domains of concentration, recent memory, remote memory, orientation, functioning and self-care of the Brief Cognitive Rating Scale, in heart disease patients admitted in ICCU. Moreover these patients had disturbance to cognitive domains such as orientation, attention and recent memory, as seen through Standardised Mini Mental Status Examination. A significant level of anxiety was observed in patients in ICCU. It is unlikely, that anxiety alone could explain all disturbances in various domains of

cognitive function, yet it is necessary to mitigate anxiety and to facilitate psychological support among these individuals.

The study has significant clinical implications in that heart disease patients admitted in ICCU, who have more severe heart disease and co-occurrence of medical conditions (hypertension, hyperlipidemia and diabetes) have more cognitive impairment compared to those admitted in general medical ward. Thus it is necessary to assess cognitive functioning in heart disease patients. It is likely that early intervention can potentially revert the condition to improve the quality of life in heart disease patients.

LIMITATIONS

The study has certain limitations. During the time that was available to conduct this study, it was possible to recruit 30 heart disease patients each from ICCU and general medical ward. A larger sample size could have helped us to divide this study group based on parameters such as age, gender and medical diagnosis. This study compared these two groups for age as well as gender and found these two groups to be comparable. Some factors could potentially affect cognitive impairment and this includes drug and nutritional status of the individuals, presence of infections and fluid and electrolyte imbalance. It was difficult to collect the number of medications that the people have taken before admission to the hospital and some of the necessary medical diagnosis and laboratory investigations were not captured in the medical records. Some of the laboratory investigations were repeated in some patients periodically depending on the medical condition and the relevancy. Though anxiety and depressive symptoms were evaluated symptomatically, it was difficult to evaluate diagnosable depression and anxiety disorder, as patients were assessed within 3 days of admission.

SUMMARY AND CONCLUSION

The study aimed to assess the cognitive functioning in persons with heart disease admitted in ICCU and to compare them with patients with heart disease admitted in general medical wards. The study was cross-sectional and study population comprised of patients diagnosed to be having cardiac disease admitted either in intensive cardiac unit and general medical ward.

During the study period between April 2011 to September 2011, thirty consecutive patients admitted in ICCU for cardiac problems and who satisfied the eligibility criteria, were recruited as cases and they were compared with thirty consecutive heart disease patients admitted in general medical wards. The study and its design was approved by the Stanley Medical college Ethics Committee. Following Informed consent, ICCU patients and general medical ward patients with heart disease, were administered a semi-structured proforma specifically designed for the purpose of the study which contained socio-demographic data, substance use demography, nature of medication and clinical history and factors related to cardiac problem. The medical records of the patients were duly examined after obtaining permission from the concerned departments.

Further the patients in the study group (cases and the control group) were also examined with standardised tools such as Standardised Mini Mental Status Examination and Brief Cognitive Rating Scale. The data obtained from

them were entered into excel sheet and the data was then transformed into Epi 6 Info for statistical analysis. Comparison between these two groups were made using Chi-square test and student t-test.

The results of the study indicated the following:

1. Patients with heart disease admitted in ICCU and general medical ward were comparable for socio-demographic variables such as age, sex, religion and occupation.

2. The two groups differed in marital status (greater proportion of married people in the ICCU group), education (more number of people with secondary level of education in ICCU group), relatively higher income in the ICCU group and Urban domiciliary status being more among the ICCU group patients.

3. Alcohol use was elicited in 30% of patients of both groups and mean duration of alcohol consumption in ICCU group as well as general medical ward group was 25%. Smoking was reported in 50% of patients with heart disease in ICCU in comparison to 30% of patients in general medical ward. The mean duration of smoking was 10 years in ICCU group and 8.6years in patients admitted in general medical wards. It is clear that smoking as a risk factor is common among heart disease in both groups.

4. Comparing the medical diagnosis at the time of admission, revealed that the prime admission medical diagnosis were coronary artery disease, specifically Infarction and arrhythmias among patients admitted in ICCU. Whereas two-thirds of the heart disease patients in general medical wards were admitted with a medical diagnosis of congestive cardiac failure. The patients in ICCU, more often present at the time of admission with dyspnoea on exertion and pain in chest, where as a combination of pedal edema, fatigue and dyspnoea on exertion was prevalent among heart disease patients admitted in general medical ward.

5. This study showed that high levels of anxiety is seen among heart disease patients in ICCU. The depressive symptoms and its intensity was found to be not statistically significant between the two groups of heart disease patients in ICCU and general medical wards.

6. A significant observation in this study is that, co-morbid conditions such as hypertension, hyperlipidemia and diabetes are more among heart disease patients in ICCU in comparison with heart disease patients in general medical wards.

7. Similarly, severity of heart disease, as determined by New York Heart Association classification, class III and class IV were seen among patients with heart disease in ICCU, whereas none of the patients in

general medical ward belonged to class III or IV under NewYork Heart Association classification. Here it is evident that the heart disease patient in ICCU had severe heart disease and co-occurrence of metabolic disorders such as hypertension, hyperlipidemia and diabetes.

8. The two groups did not differ in the duration of cardiac problem or in duration of treatment received. As regards to cognitive functions, in all the five items of Brief Cognitive Rating Scale, the heart disease patients in ICCU group exhibited impairment and the difference between the two groups was statistically significant in all the five items- Concentration, Recent memory, Past memory, Orientation , Functioning and Self-care. Moreover, comparing the two groups with Standardised Mini-Mental Status Examination, it was revealed that the heart disease patients in ICCU group demonstrated significant cognitive dysfunction in the following items- Registration, Spelling WORLD backwards, Recall, Identifying Wristwatch, repeat " No Ifs, and or buts", Reading.

9. The study showed that cognitive functioning is significantly more impaired in heart disease patients admitted in ICCU. This cognitive dysfunction may thus be associated with severity of heart disease and the presence of metabolic syndrome such ashypertension, hyperlipidemia and diabetes.

Over all this study demonstrated that patients with heart disease, particularly those with severe heart disease in ICCU, have a high prevalence of impairment to several domains of cognition. Though the ICCU patients exhibited marked distressing anxiety symptoms, this may not explain the overall cognitive dysfunction.

From this study, it can be also said that the difference in cognitive dysfunction among the two groups is not due to substance use or demographic characteristics such as age. The predominant associated factors for cognitive dysfunction are severity of heart disease and presence of co-morbid conditions.

Similar study of prevalence of cognitive dysfunction and its association with metabolic syndromes and severity of heart disease have been reported in earlier literature. Notably, an Indian study that was recently done in Haryana in India (Batla, Murthy, Chandna,2010)[1] showed that cognitive functions in domains of orientation, attention, concentration and constructional ability were impaired in patients admitted to ICCU.

FUTURE DIRECTIONS

Many improvements could be done in future, based on the study. The symptoms of anxiety and depression were evaluated within three to four days. If the study is done over a period , then it is possible to assess the persisting nature of psychological symptoms and its mediating influence on cognitive dysfunction.

Second, it is possible to conceptualise and ensure collection of uniform medical and lab data in all patients for comparison. Third, a larger sample size and replication would help to confirm the present study findings namely prevalence of cognitive dysfunction and its association with severity and comorbidity. Given the high disease burden of heart related diseases in our country, it would be of good public health importance to understand cognitive dysfunction and its associated factor in order to suggest appropriate interventions that will mitigate it effectively.

Additionally, as psychological symptoms such as anxiety appear to be prevalent in this group, effort should be taken to study this in detail and suggest interventions in intensive care unit setting.

BIBLIOGRAPHY

1. Bathla M, Murthy KK, Chandna S. Cognitive dysfunctions in intensive cardiac care unit.Indian J Psychiatry. 2010 Apr;52(2):159-63.
2. Bennett SJ, Sauve MJ. Cognitive deficits in patients with heart failure: A review of literature. J CardiovascNurs 2003;18:219-42.
3. Zuccala G, Pedone C, Cesari M, Onder G, Pahor M, Marzetti E, *et al*. The effects of cognitive impairment on mortality among hospitalized patients with heart failure. Am J Med 2003;115:97-103.
4. Barclay LL, Weiss EM, Mattis S, Bond O, Blass JP. Unrecognized cognitive impairment in cardiac rehabilitation patients. J Am GeriatrSoc 1988;36:22-8.
5. Almeida OP, Flicker L. The mind of a failing heart: A systematic review of the association between congestive heart failure and cognitive functioning. Intern Med J 2001;31:290-5.
6. Pullicino PM, Hart J. Cognitive impairment in congestive heart failure? Embolism vshypoperfusion. Neurology 2001;57:1945-6.
7. Vrobel TR. Psychiatric aspects of congestive heart failure: Implications for consulting psychiatrists. Int J Psychiatry Med 1989;19:211-25.
8. Sauve MJ, Walker JA, Massa SM, Winkle RA, Scheinman MM. Patterns of cognitive recovery in sudden cardiac arrest survivors: The pilot study.Heart Lung 1996;25:172-81.
9. Almeida OP, Tamai S. Congestive heart failure and cognitive functioning amongst older adults. ArqNeuropsiquiatr 2001;59:324-9.
10. Callegari S, Mujani G, Giardini A, Pierobon A, Opasich C, Cobelli F, *et al*. Relationship between cognitive impairment and clinical status in chronic heart failure patients. Monaldi Arch Chest Dis 2002;58:19-25.
11. Sangha SS, Uber PA, Park MH, Scott RL, Mehra MR. Difficult cases in heart failure: The challenge of neurocognitive dysfunction in severe heart failure. Congest Heart Fail 2002;8:232-4.

12. Rengo F, Acanfora D, Trojano L, Scognamiglio P, Ciaburri F, Ceriello A, *et al*. Congestive heart failure and cognitive impairment in elderly. Arch GerontolGeriatr1995;20:63-8.

13. Zuccala G, Cattel C, Manes-Gravina E, Di-Niro MG, Cocchi A, Bernabei R. Left ventricular dysfunction: A clue to cognitive impairment in older patients with heart failure. J NeurolNeurosurg Psychiatry 1997;63:509-12.

14. Zuccala G, Onder G, Pedone C, Carosella L, Pahor M, Bernabei R, *et al*. Hypotension and cognitive impairment: Selective association in patients with heart failure. Neurology 2001;57:1986-92.

15. Cacciatore F, Abete P, Ferrara N, Calabrese C, Napoli C, Maggi S, *et al*. Congestive heart failure and cognitive impairment in an older population: Osservatorio Geriatrico Campano Study Group. J Am Geriatr Soc 1998;46:1343-8.

16. Riegel B, Bennett JA, Davis A, Carlson B, Montague J, Robin H, *et al*. Cognitive impairment in heart failure: Issues of measurement and etiology. Am J Crit Care 2002;11:520-8.

17. Breteler MM, Claus JJ, Grobbee DE, Hofman A. Cardiovascular disease and distribution of cognitive function in elderly people: The Rotterdam study. BMJ1994;308:1604-8.

18. Molloy DW, Alemayehu E, Roberts R. Reliability of Standardized Mini Mental State Examination (SMMSE) compared with the traditional Mini - Mental State Examination. Am J Psychiatry 1991;148:102-5.

19. Reisberg B, Ferris SH. Brief Cognitive Rating Scale (BCRS). Psychopharmacol Bull 1988;24:629-36.

20. Almeida OP, Tamai S. Clinical treatment reverses attentional deficits in congestive heart failure. BMC Geriatr 2001;1:2.

21. Roine RO, Kajaste S, Kaste M. Neuropsychological sequelae of cardiac arrest. JAMA 1993;269:237-42.

22. Dijkstra JB, Strik JJ, Lousberg R, Prickaerts J, Riedel WJ, Jolles J, *et al*. Atypical cognitive profile in patients with depression after myocardial infarction. J Affect Disord 2002;70:181-90.

23. Grubb NR, Simpson C, Fox KA. Memory function in patients with stable, moderate to severe cardiac failure. Am Heart J 2000;140:1e-5e.

24. Sabatini T, Frisoni GB, Barbisoni P, Bellelli G, Rozzini R, Trabucchi M. Atrial fibrillation and cognitive disorders in older people. J Am GeriatrSoc 2000;48:387-90.

25. Erkinjuntti T, Gauthier S The concept of vascular cognitive impairment Front NeurolNeurosci. 2009;24:79-85. Epub 2009 Jan 26.

26. Prins ND, van Dijk EJ, den Heijer T, Vermeer SE, Jolles J, Koudstaal PJ, Hofman A, Breteler MM. Cerebral small-vessel disease and decline in information processing speed, executive function and memory. Brain. 2005 Sep;128(Pt 9):2034-41. Epub 2005 Jun 9.

27. van Dijk EJ, Prins ND, Vrooman HA, Hofman A, Koudstaal PJ, Breteler MM Progression of cerebral small vessel disease in relation to risk factors and cognitive consequences: Rotterdam Scan study. Stroke. 2008 Oct;39(10):2712-9. Epub 2008 Jul 17.

28. Viswanathan A, Gschwendtner A, Guichard JP, Buffon F, Cumurciuc R, O'Sullivan M, Holtmannspötter M, Pachai C, Bousser MG, Dichgans M, Chabriat H. Lacunar lesions are independently associated with disability and cognitive impairment in CADASIL. Neurology. 2007 Jul 10;69(2):172-9.

29. Knopman D, Boland LL, Mosley T, Howard G, Liao D, Szklo M, McGovern P, Folsom AR; Cardiovascular risk factors and cognitive decline in middle-aged adults.Atherosclerosis Risk in Communities (ARIC) Study Investigators. Neurology. 2001 Jan 9;56(1):42-8.

30. Cicconetti P, Riolo N, Priami C, Tafaro L, Ettore E. [Risk factors for cognitive impairment]. RecentiProg Med. 2004 Nov;95(11):535-45.

31. Gottesman RF, Hillis AE. Predictors and assessment of cognitive dysfunction resulting from ischaemic stroke. Lancet Neurol. 2010 Sep;9(9):895-905.

32. Vieira JR, Elkind MS, Moon YP, Rundek T, Boden-Albala B, Paik MC, Sacco RL,Wright CB. The Metabolic Syndrome and Cognitive Performance: The Northern Manhattan Study. Neuroepidemiology. 2011 Oct 15;37(3-4):153-159. [Epub ahead of print]

33. Buchman AS, Boyle PA, Wilson RS, Tang Y, Bennett DA. Frailty is associated with incident Alzheimer's disease and cognitive decline in the elderly. Psychosom Med. 2007 Jun;69(5):483-9. Epub 2007 Jun 7.

34. Boyle PA, Buchman AS, Wilson RS, Leurgans SE, Bennett DA. Physical frailty is associated with incident mild cognitive impairment in community-based older persons. J Am Geriatr Soc. 2010 Feb;58(2):248-55. Epub 2010 Jan 8.

35. Erkinjuntti T. Diagnosis and management of vascular cognitive impairment and dementia. J Neural Transm Suppl. 2002;(63):91-109.

36. Qiu C, Winblad B, Marengoni A, et al. 2006. Heart failure and the risk of dementia and Alzheimer disease. *Arch Intern Med*, 166:1003–8.

37. Trojano L, AntonelliIncalzi R, Acanfora D, et al. 2003. Cognitive impairment: a key feature of congestive heart failure in the elderly. *J Neurol*, 250:1456–63.

38. Verhaeghen P, Borchelt M, Smith J. 2003. Relation between cardiovascular and metabolic disease and cognition in very old age: cross-sectional and longitudinal fi ndings from the Berlin Aging Study. *Health Psychology*, 22:559–69.

39. Lavery L, Vander Bilt J, Chang C-CH, et al. The association between congestive heart failure and cognitive performance in a primary care population of elderly adults: the Steel Valley Seniors Survey. *Int Psychogeriatr*, . 2006

40. Breteler MMB, Claus JJ, Grobbee DE, et al.. Cardiovascular disease and distribution of cognitive function in elderly people: the Rotterdam study. *BMJ*, 1994 308:1604–8.

41. Antonelli Incalzi R, Trojano L, Acanfora D, et al.. Verbal memory impairment in congestive heart failure. *J Clin Exp Neuropsychol*, 2003 25:14–23.

42. Pandav R, Dodge HH, DeKosky ST, Ganguli, M. Blood pressure and cognitive impairment in India and the US: A cross-national epidemiological study. *Archives of Neurology (2004).* 60: 1123-1128.

43. Molloy DW, Standish TI. A guide to the standardized Mini-Mental State Examination .Int Psychogeriatr. 1997;9Suppl 1:87-94; discussion 143-50.

44. Pattison N. Psychological implications of admission to critical care.Br J Nurs. 2005 Jul 14-27;14(13):708-14.

45. Rincon HG, Granados M, Unutzer J, Gomez M, Duran R, Badiel M, Salas C, Martinez J, Mejia J, Ordoñez C, Florez N, Rosso F, Echeverri P. Prevalence, detection and treatment of anxiety, depression, and delirium in the adult critical care unit. Psychosomatics. 2001 Sep-Oct;42(5):391-6.

46. Hofhuis JG, Spronk PE, van Stel HF, Schrijvers AJ, Rommes JH, Bakker J. Experiences of critically ill patients in the ICU Intensive Crit Care Nurs. 2008 Oct;24(5):300-13. Epub 2008 May 9.

47. Samuelson KA, Lundberg D, Fridlund B. Stressful memories and psychological distress in adult mechanically ventilated intensive care patients - a 2-month follow-up study. ActaAnaesthesiol Scand. 2007 Jul;51(6):671-8.

48. Davydow DS, Gifford JM, Desai SV,et al. Posttraumatic stress disorder in general intensive care unit survivors: a systematic review**.** Gen Hosp Psychiatry. 2008 Sep-Oct;30(5):421-434

49. Kiekkas P, Theodorakopoulou G, Spyratos F, Baltopoulos GI; Psychological distress and delusional memories after critical care: a literature review. IntNurs Rev. 2010 Sep;57(3):288-96.

50. Scragg P, Jones A, Fauvel N. Psychological problems following ICU treatment Anaesthesia. 2001 Jan;56(1):9-14.

51. Myhren H, Ekeberg O, Tøien K, Karlsson S, Stokland O. Posttraumatic stress, anxiety and depression symptoms in patients during the first year post intensive care unit discharge.Crit Care. 2010;14(1):R14. Epub 2010 Feb 8.

52. Pandav RS, Chandra V, Dodge HH, DeKosky ST, Ganguli M. Hemoglobin levels and Alzheimer disease: an epidemiologic study in India.*American Journal of Geriatric Psychiatry (2004).* 12: 523-526.

53. Hoth KF, Poppas A, Moser DJ, Paul RH, Cohen RA.Cardiac dysfunction and cognition in older adults with heart failure.CognBehav Neurol. 2008 Jun;21(2):65-72.

54. Peris A, Bonizzoli M, Iozzelli D, Migliaccio ML, Zagli G, Bacchereti A, Debolini M, Vannini E, Solaro M, Balzi I, Bendoni E, Bacchi I, Trevisan M, Giovannini V, Belloni L. Early intra-intensive care unit psychological intervention promotes recovery from post traumatic stress disorders,

anxiety and depression symptoms in critically ill patients. Crit Care. 2011;15(1):R41. Epub 2011 Jan 27.

55. Shepard D. Weiner,LeRoy E. Rabbani, Cardiac Intensive Care Unit Admission CriteriaCardiac Intensive Care –second edition- 2011; page no-25-32.

56. New York Heart Association, Inc., *Diseases of the Heart and Blood Vessels: Nomenclature and Criteria for Diagnosis*, 6th ed. Boston, Little Brown, 1964, p. 114.

PROFORMA

1. Code No:

2. Place of Admission: 1)ICCU 2)ward

3. Known psychiatric/ chronic mental illness: Yes/ No

4. Family history of Psychiatric Illness: Yes/ No

5. History of consultation to a Neurologist: Yes/ No

6. Any Other general medical condition:

1) Adrenal Yes/ No
2) renal Yes/ No
3) thyroid Yes/ No
4) neurodegenerative condition Yes/ No

7. Age (enter exact age in completed years):

8. Sex: 1) male 2) female

9. Marital status: 1) single 2) married 3) divorced

10. Religion: 1) Hindu 2) Christian 3) Muslim 4) others

11. Domicile: 1) rural 2) urban

12. Education:1) Primary 2) Secondary 3) UG 3) PG 4) others

13. Occupation: 1) Unemployed 2) Unskilled 3) Semiskilled 4)Skilled 5)Professional

14. Income Data: Per capita 1) <1000 2) 1001-10,000 3) 10,001-30,000.

15. Medical Diagnosis- cardiac problem :

16. No of years of cardiac problem (in years):

17. Treatment received (in years):

18. Symptoms present at the time of admission: 1) dyspnoea on exertion 2)pain in chest 3) palpitation 4) fatigue 5) pedal edema6) others

19. The patient's functional capacity based on the New York Heart Association functional classification: 1) Class I 2) Class II 3) Class III 4) Class IV

20. Co morbid conditions: 1)Hypertension 2) Diabetes Mellitus 3)Asthma 4) Hyper- lipidemia 5) others

21. History of alcohol Intake: 1) Yes 2)No no: of years:

22. Smoking Habits: 1) Yes 2)No

23. No of years of smoking (enter years)

INFORMED CONSENT

I am a resident doing MD Psychiatry in Stanley Medical College, Chennai. As a part of my training, I am conducting a research on "Cognitive Dysfunction in ICCU Patients.", a case- control study conducted on 30 patients with heart disease in ICCU and 30 Patients with heart disease in general Medical wards. I have prepared a interview schedule for this research, which would be administered personally to all the respondents.

The purpose of study: " Cognitive Dysfunction in ICCU Patients."

A case control study.

Age group of respondents: 18-60 years

Method of data collection: Personal interviews

Tool of data collection: Interview schedule and standardised questionnaires.

Time required to complete: 60-90 minutes.

Benefits of the study: The research will help in increasing the awareness about the conditions under study namely cognitive dysfunction in patients admitted in ICCU . All respondents are registered in department of Cardiology, Stanley medical college and will receive free medicines.

Use of information collected: The information collected will be used only for academic purposes and data confidentiality would be maintained by the researcher and the institution concerned.

Risks: Sensitive questions may be avoided if the respondent does not feel comfortable answering them. The questions are framed only to ascertain the clinical characteristics and possible associated factors.

Contact person: The researcher can be contacted in person at the Department of Psychiatry, Stanley Medical College, over the phone for any clarifications and explanations regarding this study.

If you consent to be a respondent in this research, you can clarify all your doubts from the researcher, even before the interview. Kindly sign below for proceeding further. Your participation is purely voluntary.

Signature of the respondent: **Date:**

Witness: **Date:**

Appendix 3
Standardized Mini Mental State Examination (SMMSE) directions for use

Directions for Administration of SMMSE

1. Before the questionnaire is administered, try to get the subject to sit down facing you. Assess the subjects ability to hear and understand very simple conversation, e.g. What is your name? If the subject uses hearing or visual aids, provide these before starting.
2. Introduce yourself and try to get the subject's confidence. Before you commence, get the subject's permission to ask questions, e.g. Would it be all right to ask you some questions about your memory? This helps to avoid catastrophic reactions.
3. Ask each question a maximum of three times. If the subject does not respond score 0.
4. If the subject answers incorrectly score 0. Do not hint, prompt or ask the question again, e.g. what year is this? 1952. Accept that answer do not ask the question again, hint or provide any physical clues such as head shaking, etc.
5. The following equipment is required to administer the instrument: a watch, a pencil, and some blank paper. A piece of paper with CLOSE YOUR EYES is written in large letters and two 5-sided figures intersecting to make a 4-sided figure is also required.
6. If the subject answers What did you say? do not explain or engage in conversation merely repeat the same directions (e.g What year is this?) to a maximum of 3 times.
7. If the subject interrupts, e.g. What is this for? just reply:
   I will explain in a few minutes when we are finished Now if we could just proceed please... we are almost finished.

Standardized Mini Mental State Examination (SMMSE)

I am going to ask you some questions and give you some problems to solve. Please try and answer as best as you can.

✓QUESTIONS	MAXIMUM SCORE
1. (Allow 10 seconds for each reply)	1 point for each answer
a) What year is this? (accept exact answer only)	
b) What season is this? (during last week of the old season or first week of a new season, accept either season)	
c) What month of the year is this? (on the first day of new month, or last day of the previous month, accept either)	
d) What is today's date?	

(accept previous or next date, e.g. on the 7th accept the 6th or 8th)

e) What day of the week is this? (accept exact answer only)

2. (Allow 10 seconds for each reply) 1 point for each answer

a) What county are we in? (accept exact answer only)

b) What province/state/country are we in? (accept exact answer only)

c) What city/town are we in? (accept exact answer only)

d) **(In clinic)** What is the name of this hospital/building? (accept exact name of hospital or institution only)

(In home) What is the street address of this house? (accept street name and house number or equivalent in rural areas)

e) **(In clinic)** What floor of the building are we on? (accept exact answer only)

(In home) What room are we in? (accept exact answer only)

3. *I am going to name 3 objects.* *After I have said all three objects, I want you to repeat them.* 3

Remember what they are because I am going to ask you to name then again in a few minutes.
(say them slowly at approximately 1 second intervals)

Ball	**Car**	**Man**

For repeated use:

Bell	**Jar**	**Fax**
Bill	**Tar**	**Can**
Bull	**War**	**Pan**

Please repeat the 3 items for me.

(score 1 point for each correct reply on the first attempt)

Allow 20 seconds for reply, if subject did not repeat all 3, repeat until they are learned or up to a maximum of 5 times.

4. *Spell the word WORLD* 5

(you may help subject to spell world correctly)

Say: *now spell it backwards please.* Allow 30 seconds to spell backwards.

(If the subject cannot spell backwards - even with assistance - score 0)

5. *Now what were the 3 objects that I asked you to remember?* 3

Ball	**Car**	**Man**

Score 1 point for each correct response regardless of order, allow 10 seconds.

6. Show wristwatch. Ask: *what is this called?* 1

Score 1 point for correct response. Accept "wristwatch" or "watch". Do not accept "clock", "time", etc. (allow 10 seconds)

7. Show pencil. Ask: *what is this called?* 1

Score 1 point for correct response, accept pencil only - score 0 for pen.

8. I'd like you to repeat a phrase after me: "No ifs, ands or buts". 1

(allow 10 seconds for response. Score 1 point for a correct repetition. Must be **exact**, e.g. No ifs or buts - score 0)

9. Read the words on this page and then do what it says: 1

Hand subject a sheet of paper with CLOSE YOUR EYES written on it.

CLOSE YOUR EYES

If subject just reads and does not then close their eyes you may repeat: read the words on this page and then do what it says to a maximum of 3 times. Allow 10 seconds, score 1 point **only** if subject closes their eyes. Subject does not have to read aloud.

10. Ask if the subject is right- or left-handed. Alternate right/left hand in statement, e.g. if the subject is right-handed, say: Take this paper in your left hand... Take a piece of paper hold it up in front of subject and say the following: 3

"Take this paper in your right/left hand, fold the paper in half once with both hands and put the paper down on the floor."

Takes paper in correct hand 1

Folds it in half 1

Puts it on the floor 1

Allow 30 seconds. Score 1 point for each instruction correctly executed.

11. Hand subject a pencil and paper. 1

Write any complete sentence on that piece of paper.

Allow 30 seconds. Score 1 point. The sentence should make sense. Ignore spelling errors.

12. Place design, pencil, eraser and paper in front of the subject. 1

Say: copy this design please.

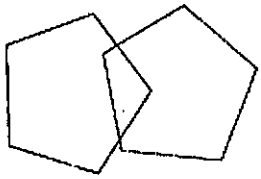
Allow multiple tries until patient is finished and hands it back. Score 1 point for correctly copied diagram. The subject must have drawn a 4-sided figure between two 5-sided figures. Maximum time - 1 minute.

Total Test Score	**30**

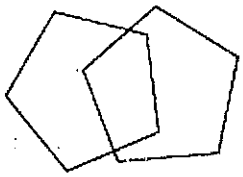
Scoring the figure

The subject must draw two 5-sided figures intersected by a 4-sided figure.

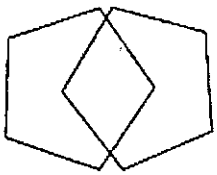
CORRECT
Score 1



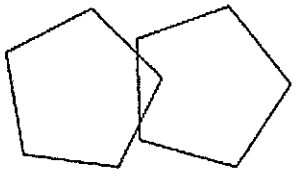
INCORRECT
Score 0



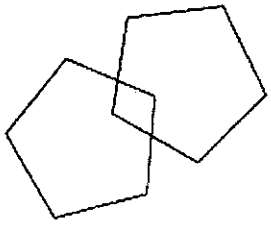
CORRECT
Score 1



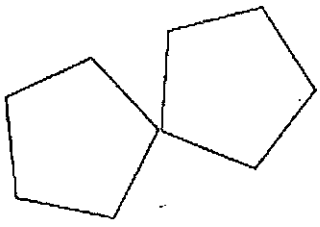
INCORRECT
Score 0



CORRECT
Score 1



INCORRECT
Score 0



Time completed: _____ (minutes)

Scoring "WORLD" backwards

Correct response: DLROW	Score 5
Omission of one letter: e.g. DLRW; DLOW; DROW; DLRO	Score 4
Omission of two letters: e.g. DLR; LRO; DLW	Score 3
Reversal of two letters: e.g. DLORW; DRLOW; DLRWO; DLWOR	Score 3
Omission/reversal of three letters: e.g. DORLW; DL. OW	Score 2
Reversal of four letters: e.g. DRLWO; LDRWO	Score 1

BRIEF COGNITIVE RATING SCALE (BCRS)

INSTRUCTIONS

Each axis of the **Brief Cognitive Rating Scale** is scored independently. Each axis is designed to be optimally concordant with the other axes and with the numerically corresponding Global Deterioration Scale stage. Consequently, each axis of the BCRS conveys important staging related information.

For clinical purposes scores can be reported conveniently as consecutive axis scores, e.g., "6,5,6,4,5". This reporting methodology indicates relative capacity in each axis modality, i.e., concentration, recent memory, etc.

For therapeutic trials the axes can be added and total scores for the five axes can be utilized.

For staging, the Global Deterioration Scale stage is very closely equivalent to the average score of the BCRS axes. Ideally, for staging purposes, the BCRS can be used as a semistructured procedure for guiding final GDS stage assignments.

AME: _____ ID#: _____ DATE: ___/___/___ PERIOD: _____

BRIEF COGNITIVE RATING SCALE (BCRS)[1,2]

INFORMANT: _____ RELATIONSHIP OF INFORMANT: _____

AXIS I: CONCENTRATION (circle only one, i.e., the most appropriate level)

1 No objective or subjective evidence of deficit in concentration.

2 Subjective decrement in concentration ability.

3 Minor signs of poor concentration (e.g., subtraction of serial 7s from 100).

4 Definite concentration deficit for persons of their background (e.g., marked deficit on serial 7s, frequent deficit in subtraction of serial 4s from 40).

5 Marked concentration deficit (e.g., giving months backwards or serial 2s from 20).

6 Forgets the concentration task. Frequently begins to count forward when asked to count backwards from 10 by 1s.

7 Marked difficulty counting forward to 10 by 1s.

AXIS II: RECENT MEMORY (circle only one, i.e., the most appropriate level)

1 No objective or subjective evidence of deficit in recent memory.

2 Subjective impairment only (e.g., forgetting names more than formerly).

3 Deficit in recall of specific events evident upon detailed questioning (e.g. about recent meals, current reading, recent appointments, etc). No deficit in the recall of major recent events.

4 Cannot recall major events of previous weekend or week. Scanty knowledge (not detailed) of current events, favorite TV shows, etc. May not know telephone number and/or telephone area code and/or postal (zip) code.

5 Unsure of weather, and/or may not know current president and/or current address.

6 Occasional knowledge of some recent events. Little or no idea of current address, weather, etc. Given the current president's first name, may recall their last name.

7 No knowledge of any recent events.

[1]Adapted from Reisberg, B. and Ferris, S.H., Brief Cognitive Rating Scale (BCRS). *Psychopharmacology Bulletin,* 1988;24:629-636.

AXIS III: PAST MEMORY (circle only one, i.e., the most appropriate level)

1 No subjective or objective impairment in past memory.

2 Subjective impairment only. Can recall two or more primary school teachers.

3 Some gaps in past memory upon detailed questioning. Able to recall at least one childhood teacher and/or one childhood friend.

4 Clear-cut deficit. The spouse recalls more of the patient's past than the patient. Cannot recall childhood friends and/or teachers but knows the names of schools attended. Confuses chronology in reciting personal history.

5 Major past events sometimes not recalled (e.g., names of schools attended). Characteristically, at this stage patients recall some schools attended, but not others.

6 Some residual memory of past (e.g., may recall country of birth or former occupation, may or may not recall mother's name, may or may not recall father's name). Generally, patients do not recall any of the schools which they attended.

7 No memory of past (cannot recall country, state, or town of origin, cannot recall names of parents, etc).

AXIS IV: ORIENTATION (circle only one, i.e., the most appropriate level)

1 No deficit in memory for time, place, identity of self or others.

2 Subjective impairment only. Knows time to the nearest hour. Knows location.

3 Any mistake in time of two hours or more, day of the week of 1 day or more, date of 3 days or more.

4 Mistakes day of the month by 10 days or more, and/or confuses month of the year by 1 month or more.

5 Unsure of month and/or year and/or season, unsure of locale.

6 No idea of date. Identifies spouse but may not recall name. Knows own name.

7 Cannot identify spouse. May be unsure of personal identity.

AXIS V: FUNCTIONING AND SELF-CARE [a] (circle only one, i.e., the most appropriate level)

1 **No difficulty**, either subjectively or objectively.

2 Complains of forgetting location of objects. **Subjective work difficulties.**

3 Decreased job functioning evident to co-workers. Difficulty in traveling to new locations. **Decreased organizational capacity.***

4 **Decreased ability to perform complex tasks**, e.g., planning dinner for guests, handling personal finances (such as forgetting to pay bills), difficulty marketing, etc.*

5 **Requires assistance in choosing proper clothing** to wear for the day, season, or occasion, e.g. patient may wear the same clothing repeatedly, unless supervised.*

6 **Requires assistance in putting on clothing**, and/or bathing, and/or toileting, and/or feeding.*

7 **Requires constant assistance** in all activities of daily life.*

*Scored primarily on the basis of information obtained from a knowledgeable informant and/or caregiver.

[a]The Functional Assessment Staging (FAST) scale can be utilized in lieu of Axis V for more precise staging.

Hospital Anxiety and Depression Scale (HADS)

Patients are asked to choose one response from the four given for each interview. They should give an immediate response and be dissuaded from thinking too long about their answers. The questions relating to anxiety are marked "A", and to depression "D". The score for each answer is given in the right column. Instruct the patient to answer how it currently describes their feelings.

A	**I feel tense or 'wound up':**	
	Most of the time	3
	A lot of the time	2
	From time to time, occasionally	1
	Not at all	0

D	**I still enjoy the things I used to enjoy:**	
	Definitely as much	0
	Not quite so much	1
	Only a little	2
	Hardly at all	3

A	**I get a sort of frightened feeling as if something awful is about to happen:**	
	Very definitely and quite badly	3
	Yes, but not too badly	2
	A little, but it doesn't worry me	1
	Not at all	0

D	**I can laugh and see the funny side of things:**	
	As much as I always could	0
	Not quite so much now	1
	Definitely not so much now	2
	Not at all	3

A	**Worrying thoughts go through my mind:**	
	A great deal of the time	3
	A lot of the time	2
	From time to time, but not too often	1
	Only occasionally	0

D	**I feel cheerful:**	
	Not at all	3
	Not often	2
	Sometimes	1
	Most of the time	0

A	**I can sit at ease and feel relaxed:**	
	Definitely	0
	Usually	1
	Not Often	2
	Not at all	3

D	**I feel as if I am slowed down:**	
	Nearly all the time	3
	Very often	2
	Sometimes	1
	Not at all	0

A	**I get a sort of frightened feeling like 'butterflies' in the stomach:**	
	Not at all	0
	Occasionally	1
	Quite Often	2
	Very Often	3

D	**I have lost interest in my appearance:**	
	Definitely	3
	I don't take as much care as I should	2
	I may not take quite as much care	1
	I take just as much care as ever	0

A	**I feel restless as I have to be on the move:**	
	Very much indeed	3
	Quite a lot	2
	Not very much	1
	Not at all	0

D	**I look forward with enjoyment to things:**	
	As much as I ever did	0
	Rather less than I used to	1
	Definitely less than I used to	2
	Hardly at all	3

A	**I get sudden feelings of panic:**	
	Very often indeed	3
	Quite often	2
	Not very often	1
	Not at all	0

D	**I can enjoy a good book or radio or TV program:**	
	Often	0
	Sometimes	1
	Not often	2
	Very seldom	3

	Scoring (add the As = Anxiety. Add the Ds = Depression). The norms below will give you an idea of the level of Anxiety and Depression.	
	0-7 = Normal	
	8-10 = Borderline abnormal	
	11-21 = Abnormal	

Reference:

Zigmond and Snaith (1983)

Code no	Place admitted	age	sex	marital status	religion	domicile	education	occupation	income	medical diagnosis	no of years of problem	no: of years of treatment	symptoms at the time of admission	NYHA classification	Comorbid conditions	alcohol intake	No: of years	Smoking	No: of years	Anxiety total score of HADS	Dep Total Score of HADS
oo1	1	57	2	2	1	1	1	1	2	anterior wall M I	5	5	1,2	CLASS IV	1,2,4	2		2		16	14
oo2	2	53	2	3	1	1	1	1	1	congestive cardiac failure	3	1	1,4	CLASS II	5	2		2		12	8
oo3	1	64	1	2	1	2	2	1	2	Inferior wall MI/Ventricular arrhythmia	4	1	3,4	CLASS IV	1,3,4	1	30	1	30	13	16
oo4	2	46	1	2	1	2	4	5	3	arrhythmia	5	1	3,4	CLASS I	2	2		2		9	9
oo5	1	35	1	2	1	2	1	3	2	acute coronary syndrome, CAD	2	1	1,2,4	CLASS III	2,4	1	5	1	6	19	18
oo6	2	55	1	2	1	2	1	3	1	congestive cardiac failure	4	1	1,4,5	CLASS II	..	1	20	1	30	15	19
oo7	1	36	2	2	3	1	1	1	2	acute coronary syndrome, NSTEMI	4	2	1,2,4	CLASS III	1,2,4	2		2		20	18
oo8	2	56	1	2	1	1	1	2	2	valvular heart disease, ccf	14	13	1,4	CLASS II	2	1	4	2	20	12	14
oo9	1	47	1	2	3	1	2	3	2	acute coronary syndrome, CAD, arrythmia	4	2	1,2,3	CLASS IV	1,4	2		1	27	15	13
o10	2	55	1	2	1	1	2	3	2	congestive cardiac failure	3	2	1,4	CLASS II	1	2		2		10	12
o11	1	35	2	2	1	2	1	1	1	arrhythmia	1	1	2,3	CLASS III	1,2,4	2		2		14	12
o12	2	72	1	2	2	1	1	1	2	congestive cardiac failure	9	5	1,4,5	CLASS I	1,2	2		1	25	12	14
o13	1	65	1	2	1	1	1	2	2	anterior wall M I, arrythmia	20	5	1,2,3,4	CLASS IV	1,4	1	5	1	5	16	14
o14	2	40	1	2	1	1	1	1	1	Rheumatic heart disease. CCF	5	0	1,4	CLASS I	..	1	10	1	8	11	12
o15	1	55	1	2	3	1	1	2	2	acute coronary syndrome, CAD, arrythmia	5	0	1,2,3,4	CLASS III	,,	2		2		19	13
o16	2	65	1	2	1	1	1	1	2	dilated cardiomyopathy in failure	14	..	4,5	CLASS I	,,	1	20	1	40	16	12
o17	1	59	1	2	1	2	2	3	2	anterior wall MI, arrythmia	15	2	1,3,4	CLASS IV	1,2,4	1	30	1	30	16	14
o18	2	19	1	1	1	2	2	3	2	Rheumatic heart disease. CCF	9	8	1,4,5	CLASS II	4	2		2		17	14
o19	1	38	2	2	2	2	3	1	2	acute coronary syndrome, CAD	5	0		CLASS III	,,	2		2		11	10
o20	2	64	1	2	3	2	1	2	2	congestive cardiac failure	14	10	1,4,5	CLASS II	2,4	2		2		14	9
o21	1	70	1	2	1	2	2	3	2	anterior wall MI, arrythmia	15	12	1,2,3	CLASS IV	1,2	2		2		14	10
o22	2	58	1	2	2	2	1	2	1	arrhythmia	5	2	1,3	CLASS II	3,4	1	15	1	30	9	11
o23	1	64	1	2	1	2	1	4	2	Inferior wall MI/Ventricular arrhythmia	5	3	,2,3,4,5	CLASS IV	1,4	1	10	1	30	13	10
o24	2	55	1	2	1	1	1	1	2	CAD in failure	5	3	1,4,5	CLASS II	1,2	2		2		7	12
o25	1	70	1	2	3	2	1	3	1	inferior wall MI & posterior wall MI	5	1	1,2	CLASS III	,,	2		1	50	17	15
o26	2	45	2	2	1	1	1	1	1	congestive cardiac failure	5	1	1,4,5	CLASS II	1,2,3,4	2		2		15	14
o27	1	35	2	2	1	2	2	1	1	arrhythmia	5	<1	3,4	CLASS III	,,	2		2		12	9
o28	2	58	2	2	1	1	1	1	1	arrhythmia in failure	13	10	1,3	CLASS I	1	2		2		12	8
o29	1	59	1	2	1	2	1	3	2	anterior wall M I	25	25	1,2,3,4	CLASS IV	1,2,	2		1	20	18	14
o30	2	70	1	2	1	1	5	1	1	congestive cardiac failure	5	0	1,4,5,6	CLASS II	,,	2		2		9	9
o31	1	68	1	1	1	1	1	2	1	evolved Anterior wall MI and arrythmia	20	5	1,2,3,4	CLASS IV	1,2,4	1	30	1	40	14	11
o32	2	64	1	2	1	1	5	1	1	arrythmias	5	4	1,3,4	CLASS II	1,2	1	35	1	40	10	10
o33	1	59	1	2	1	2	2	3	2	inferior wall MI	10	10	1,2,4	CLASS IV	3	1	25	1	30	10	8
o34	2	54	1	2	1	1	1	2	2	cardiac failure	5	0	1,4	CLASS II	1	1	20	1	30	16	13
o35	1	38	1	2	1	1	2	2	2	Rheumatic heart disease, AF	5	5	3,4	CLASS IV	,,	2		2		17	12
o36	2	54	2	3	3	2	2	3	1	coronary artery disease	5	0	1,2,4	CLASS I	1,2,4	2		2		11	9
o37	1	59	2	2	3	1	1	1	1	Inferior wall M I	5	2	2,4,5	CLASS III	1,2,3,4	2		2		16	12
o38	2	39	1	2	1	2	1	3	3	congestive cardiac failure	10	0	1,4,5	CLASS I	2,3,4	1	15	1	20	14	10
o39	1	72	2	2	1	1	1	1	1	anterior wall MI, arrythmia	20	10	1,2,3,4	CLASS IV	1,2,4	2		2		15	12
o40	2	54	1	2	1	1	1	2	2	Rheumatic heart disease. CCF	25	10	1,4,5	CLASS I	2	2		2		9	13
o41	1	69	1	2	1	2	1	1	2	acute coronary syndrome, CAD	5	1	1,2,4	CLASS III	1,2,4	2		2		20	17
o42	2	36	1	1	1	1	1	1	1	dilated cardiomyopathy in failure	5	3	1,4,5	CLASS I	,,	1	10	1	8	13	12
o43	1	58	1	2	3	1	1	2	2	STEMI,IWMI,PWMI	5	1	1,2,4	CLASS III	1,2	2		2		17	15
O44	2	45	1	2	1	1	1	2	2	coronary artery disease	5	2	2,4	CLASS I	1,4	2		2		19	16
o45	1	36	1	1	1	2	1	3	2	acute coronary syndrome	3	1	1,2	CLASS III	1,4	1	10	1	12	15	13
o46	2	65	1	2	1	1	5	2	2	dilated cardiomyopathy in failure	5	5	1,4,5	CLASS I	3	2		2		8	11
o47	1	45	1	2	3	2	1	3	1	Rheumatic heart disease, AF,MS,MR	25	15	1,3,4,5	CLASS IV	4	2		1	25	18	13
o48	2	30	2	2	1	1	5	1	1	Rheumatic heart disease, AF	12	10	1,3,4	CLASS I	3	2		2		10	12
o49	1	56	2	2	2	2	2	1	2	CAD in failure, arrythmia	5	1	1,2,3,4	CLASS III	1,2,4	2		2		19	11
o50	2	20	2	1	2	1	5	1	1	Rheumatic heart disease,AF, IE	10	7	1,3,4,5	CLASS I	,,	2		2		11	14
o51	1	54	1	2	3	2	1	3	2	acute coronary syndrome, AWMI	5	1	1,2,4	CLASSIII	1,2,4	2		1	35	20	12
o52	2	34	1	1	1	1	5	1	1	rhematic heart disease in failure	9	3	1,4,5	CLASS I	3	2		2		13	14
o53	1	69	1	2	2	2	2	1	1	acute AWMI	15	3	1,2,4	CLASS IV	1,2,4	2		1	30	11	8
o54	2	54	2	2	3	2	2	3	3	congestive cardiac failure	10	8	1,4,5	CLASS I	1,2.4	2		2		15	12
o55	1	58	1	2	1	2	1	3	2	acute IWMI	20	12	1,2,4,5	CLASS IV	1,4	2		2		14	10
o56	2	18	2	1	2	1	1	1	1	rheumatic heart disease in failure	10	6	1,4	CLASS I	,,	2		2		12	12
o57	1	58	2	2	1	2	1	1	1	anterior wall MI, arrythmia	15	5	2,3,4	CLASS IV	1,2,4	2		2		18	13
o58	2	60	2	3	2	1	5	1	1	Atrial septal defect in failure	25	15	1,4,5	CLASS I	3	2		2		14	12
o59	1	65	1	2	1	1	1	2	2	anterior wall M I, arrythmia	20	5	1,2,3,4	CLASS IV	1,4	1	5	1	5	19	14

o60	2	66	2	1	1	1	5	1	1	congestive cardiac failure	5	0	1,4,5	CLASS I	1,3	2		2		11	12

SMMSE 1a	SMMSE1 b	SMMSE1 c	SMMSE1 d	SMMSE 1e	SMMSE 2a	SMMSE 2b	SMMSE2 c	SMMSE 2d	SMMSE2 e	SMMSE 3	SMMSE 4	SMMSE 5	SMMSE 6	SMMSE7	SMMSE8	SMMSE 9	SMMSE10	SMMSE11	SMMSE12	BCRS-AXIS-I	BCRS-AXIS-II	BCRS-AXIS-III	BCRS-AXIS-IV	BCRS-AXIS-V
0	0	0	0	0	1	1	1	1	0	3	2	0	1	1	0	0	3	0	0	5	5	4	5	5
0	1	1	0	1	0	1	1	1	0	2	3	1	1	1	0	1	2	0	0	2	1	2	3	3
1	0	1	1	1	1	1	1	1	1	3	3	1	1	1	0	1	3	1	1	4	4	3	4	4
1	1	1	1	1	1	1	1	1	1	3	4	3	1	1	1	1	3	1	1	3	1	1	1	1
0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0	1	3	0	0	3	4	2	5	3
1	1	1	1	1	1	1	1	1	1	3	3	3	1	1	1	1	3	1	0	4	1	1	1	2
0	0	1	1	1	1	1	1	1	1	3	3	3	0	1	0	1	3	1	1	2	3	3	3	4
1	1	1	1	1	1	1	1	1	1	3	4	2	1	1	1	1	3	1	1	4	1	1	1	1
0	0	0	1	1	1	1	1	1	0	3	3	3	1	1	1	1	3	1	1	1	2	1	3	3
1	1	1	1	1	1	1	1	1	1	3	3	2	1	1	1	1	3	1	0	1	1	1	1	1
0	0	1	0	1	1	1	1	1	0	3	2	3	1	1	1	1	3	1	1	3	2	2	2	2
1	1	1	1	1	1	1	1	1	1	3	4	2	1	1	1	1	3	1	0	1	1	1	1	1
0	0	0	0	0	0	0	0	1	0	0	0	3	0	1	0	0	0	1	0	6	3	5	5	7
1	1	1	1	1	0	1	1	0	1	3	4	2	1	1	1	1	3	0	1	1	1	1	1	1
0	0	1	0	0	1	1	1	1	0	3	3	1	1	1	1	1	3	1	1	3	3	1	3	5
1	1	1	0	0	1	1	1	0	0	2	3	2	1	1	0	1	2	0	0	2	3	3	2	2
0	0	1	1	0	1	1	1	1	1	3	3	3	1	1	0	1	3	1	0	3	2	3	3	4
1	1	1	1	1	1	1	1	1	1	3	5	2	1	1	1	1	3	1	1	1	1	1	1	1
0	0	1	1	1	1	1	1	1	1	3	3	1	1	1	0	1	3	1	1	3	3	1	3	5
1	1	1	1	1	1	1	1	1	1	3	4	2	1	1	1	1	3	1	0	2	1	1	1	3
0	0	1	1	1	1	1	1	1	0	2	3	1	1	1	0	1	3	1	1	7	6	6	3	4
1	1	1	1	1	1	1	1	1	1	3	4	3	1	1	1	1	3	0	0	2	1	2	1	1
0	0	1	1	1	1	1	1	1	0	3	3	2	1	1	0	1	3	1	1	5	6	6	3	3
1	1	1	1	1	1	1	1	1	1	3	3	2	1	1	0	1	3	1	0	3	2	1	1	2
0	0	0	1	1	1	1	1	1	0	3	2	2	1	1	0	1	1	0	0	2	3	3	3	3
1	0	1	1	1	1	1	1	1	1	3	4	3	1	1	0	1	3	1	1	2	2	2	1	1
1	0	1	0	0	1	1	1	1	1	3	3	3	1	1	1	1	3	1	0	3	1	1	1	1
1	0	1	1	1	1	1	1	1	1	3	4	2	1	1	0	1	3	0	0	3	3	1	1	3
1	0	1	0	0	1	1	1	1	1	3	3	2	1	1	0	1	3	0	0	4	3	3	1	4
1	0	1	1	1	1	1	1	1	0	2	3	0	1	1	0	1	3	0	0	4	4	3	3	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	7	7	7	6	7
1	0	1	1	1	1	1	1	1	0	1	2	0	1	1	0	1	1	0	0	4	3	4	2	4
1	0	1	1	1	1	1	1	1	0	3	3	2	1	1	0	1	3	0	0	3	3	1	1	3
1	1	1	1	1	1	1	1	1	0	3	3	1	1	1	0	1	3	0	0	3	2	4	1	3
1	1	1	1	0	1	1	1	1	0	3	3	2	1	1	1	1	3	1	0	3	1	1	1	2
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	1	1	1	1	1	1	1
1	0	1	1	1	1	1	1	1	0	2	3	1	1	1	0	0	3	1	0	3	3	2	1	3
1	1	1	1	1	1	1	1	1	1	2	3	1	1	1	0	1	3	1	1	3	2	1	1	3
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	3	0	0	5	5	3	5	7
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	1	0	1	1	1	1	1
1	1	0	0	1	1	1	1	0	0	3	0	1	1	1	0	1	3	0	0	4	4	2	2	4
1	1	1	0	0	0	0	1	1	0	2	2	2	1	1	0	1	2	0	0	2	3	3	3	4
0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	5	5	3	5	6
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	1	1	2	2	1	1	2
1	1	1	1	1	1	1	1	1	1	3	4	2	1	1	1	1	3	1	0	3	2	1	2	3
1	1	1	1	1	1	1	1	1	1	3	5	2	1	1	1	1	3	1	0	1	1	1	1	1
1	1	1	0	0	1	1	1	1	0	2	2	0	1	1	0	1	3	0	0	5	3	2	3	5
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	0	0	1	1	1	1	1
1	1	1	0	0	1	1	1	1	0	3	3	2	1	1	0	1	3	0	0	4	3	2	2	4
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	1	0	2	1	1	1	2
1	0	1	1	0	1	1	1	1	0	3	3	1	1	1	0	1	3	0	0	4	4	1	2	4
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	0	1	2	1	1	1	2
1	0	1	1	0	1	1	1	1	0	2	2	1	1	1	0	1	3	0	0	6	4	2	2	5
1	1	1	1	1	1	1	1	1	1	3	3	2	1	1	1	1	3	1	1	1	1	1	1	2
1	0	1	1	0	1	1	1	1	0	2	3	1	1	1	0	1	3	0	0	4	5	2	3	6
1	1	1	1	1	1	1	1	1	1	3	5	3	1	1	1	1	3	1	1	1	1	1	1	1
1	0	1	1	0	1	1	1	1	0	2	2	1	1	1	0	1	3	0	0	4	4	2	3	6
1	1	1	1	1	1	1	1	1	1	2	3	2	1	1	1	1	3	0	0	3	2	1	1	4
0	0	0	0	0	0	0	0	1	0	0	0	3	0	1	0	0	0	1	0	6	3	5	5	7

1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	0	1	3	0	0	3	2	1	1	3